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SHOT JOHNIE BOY

PROJECT OFFICERS REPORT—PROJECT 2.9

FALLOUT SAMPLING AND ANALYSIS: RADIATION DOSE RATE AND DOSE HISTORY AT 16 LOCATIONS (U)

D.E. Clark, Jr., Project Officer

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San Francisco 24, California

Issuance Date: October 24, 1963

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66 CHIEF OF NAVAL OPERATIONS OP-94
67 CHIEF OF NAVAL OPERATIONS OP-922F2
68- 69 CHIEF OF NAVAL OPERATIONS CODE 811
70- 72 CHIEF BUREAU OF NAVAL WEAPONS DLI-3
73 CHIEF BUREAU OF MEDICINE & SURGERY CODE 74
74 CHIEF BUREAU OF SHIPS CODE 423
75 CHIEF BUREAU OF SHIPS CODE 362
76 CHIEF BUREAU OF YARDS & DOCKS CODE 74
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78- 79 U S NAVAL ORDNANCE LABORATORY
80 MATERIAL LABORATORY CODE 900
81 NAVY ELECTRONICS LABORATORY
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152 FIELD COMMAND DASA FCTG
153-154 FIELD COMMAND DASA FCWT
155-156 DEFENSE INTELLIGENCE AGENCY
157 U S COAST GUARD
158 JOINT TASK FORCE-8
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This document is the author(s) report to the Chief, Defense Atomic Support Agency, of the results of experimentation sponsored by that agency during nuclear weapons effects testing. The results and findings in this report are those of the author(s) and not necessarily those of the DOD. Accordingly, reference to this material must credit the author(s). This report is the property of the Department of Defense and, as such, may be reclassified or withdrawn from circulation as appropriate by the Defense Atomic Support Agency.

DEPARTMENT OF DEFENSE
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ABSTRACT

The objectives of this project were: (1) to obtain quantitative collections of fallout to determine mass per unit area, ionization decay rates, and size-activity relationships; (2) to compare radiochemical, chemical, and physical properties of environmental surface material and fallout material; and (3) to measure, during fallout, the radiation dose rate and accumulated integrated dose with time without discriminating among initial, transit, and deposited radiation sources.

All sixteen of the stations in the array received measurable amounts of fallout. Quantitative measurements of fallout mass per unit area, ionization decay, and size-activity relationships are tabulated for most of the stations. Radiochemical analyses of 46 samples for as many as 13 radionuclides are tabulated and indicate the expected amount of fractionation for the type of weapon used. Particle studies on selected samples show that from 0 to 50 percent of the particles in a sample are radioactive, and comparative photomicrographs and autoradiographs of characteristic particles are shown. Selected particles with different physical properties showed identical gamma-ray

spectra when subjected to leaching and exchange experiments, indicating the need for further study of the mechanism of fallout formation. Neutron-induced Na^{24} predominated in early-time gamma-ray spectra. This indicates an efficient coupling of the neutron flux of the subsurface weapon with the Na^{24}-producing materials contained within the crater volume.

Dose rate and dose histories were well documented at most stations and are presented in graphic and tabular form. Some inaccuracy of the true gamma-dose values exists because of uncertainty in initial gamma-dose determination due to terrain shielding and weapon detonation geometry. Most of the fallout was down at the array stations in less than one hour and the dose rate curves at most stations show similar decay rates approximating $t^{-1.2}$.

PREFACE

Deserving of high praise are the U.S. Naval Radiological Defense Laboratory (NRDL) Engineering Division who expedited the fabrication and shipment of equipment to the field and the personnel of Small Boy Projects 2.9 and 2.11 who helped with the field installation to meet the scheduled shot date. The entire job was done in one month.

Appreciation is also expressed to Capt A. Anthony, Air Force Special Weapons Center, Kirtland Air Force Base, New Mexico, for furnishing early-time samples taken from the fallout cloud by aircraft.

Recognition is also given to NRDL personnel who helped with the laborious task of data reduction for analysis and presentation in this POR. Special thanks is due L.R Bunney for the radiochemistry data, S. L. Stewart and W. Fung for the IBM 704 computer processing of the GITR and sample analysis data, C.H. Bennett and L. L. Wiltshire for getting the field sample data onto punched cards, and W.C. Cobbin for his help in getting the Project Officer "out of the woods" in many of the report preparation tasks.

CONTENTS

SECRET

TABLES

SECRET

FIGURES

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVES

The specific objectives of this project were (1) to make quantitative collections of fallout from a low-yield tactical weapon in order to determine mass per unit area, ionization decay rate, and size-activity relationships at sixteen selected locations in the predicted fallout pattern within one mile of ground zero; (2) to analyze and compare radiochemical, chemical and physical properties of fallout material with those of the environmental surface material; and (3) to measure, during fallout, the radiation dose rates and accumulated dose with time near each of the sixteen collection stations without discriminating among initial, transit, and deposited radiation sources.

1.2 BACKGROUND

Starting with Operation Greenhouse in 1950, the U.S. Naval Radiological Defense Laboratory (NRDL) has participated in fallout programs of most of the weapons tests to date and has contributed to the present understanding of many of the aspects of initial gamma radiation, fallout formation, transport, deposition and gamma radiation fields.

Data on radioactive fallout produced by nuclear explosions provide useful information leading to the effective development of countermeasures. The data may be divided into four study areas: (1) the formation of fallout; (2) the distribution of fallout; (3) the radiological exposure environment; and (4) the alteration of exposure environment by countermeasures.

Theoretical studies, data compilations, or empirical generalizations of experimental data in each of the four study areas may be considered in terms of a thermochemical model of the fallout formation process, a meteorological model of the distribution process, a hazard model of the exposure environment, and a countermeasure system model that can be used to change, in a desired way, the exposure environment. The collections, field measurements, and sample analysis of this project contribute most directly to the formation or evaluation of the theoretical or empirical models in all the above areas.

The present plan, based on extensive past experience, was intended to provide data on radiological, physical, and chemical properties of fallout at a limited number of sampling points for a weapon and environment different from Shot Small Boy. The opportunity to participate in as many different events as possible provides valuable data for the determination of fallout characteristics.

CHAPTER 2

PROCEDURE

A successful fallout collecting and analysis project requires the satisfactory solution of several problems: (1) locating of measurement stations within the fallout pattern, (2) selection of instrumentation to cover the range of expected measurement values and meeting operational requirements of instrument and fallout collector placement and recovery during variable preshot times and postshot times when control of radiation dose to recovery personnel is of prime importance, (3) determination of the best sample handling and analysis techniques in the field and at the home laboratory, and (4) processing of the data to achieve the objectives of the project.

2.1 PLANNING

The greatest uncertainty in any fallout collection project lies in the proper placement of the collectors to be within the fallout pattern. The meteorological factors affecting the fallout distribution process are difficult to predict far in advance of shot time. Difficulties such as delay of shot time and low priority of the fallout project have added to the problem of proper collector

placement.

In an effort to obtain greater reliability in proper collector placement in the present project, careful consideration was given to estimating the meteorological factors. From weather records, seasonal trends in wind structure were established, and a computer-programmed fallout model developed by NRDL (Reference 1) was applied to predict probable fallout patterns. In addition to the long-term fallout pattern predictions based on seasonal wind trends used for the placement of fallout collectors, it was planned to telephone wind data at shot time for computer input for a prediction of the actual fallout patterns. The dual purpose of this procedure was to predict radiation-intensity patterns that could facilitate planning of sample-recovery procedures, and to check the validity of the fallout model.

2.2 STATION ARRAY

Figure 2.1 shows the fallout-collection station array in relation to ground zero (GZ). The array was originally a symmetrical arrangement about the 335° bearing line through ground zero which matched the planning wind from 155°. As shot time approached, it became apparent that the symmetrical array might not lie

entirely within the fallout pattern and that the predicted shot-time wind from 210° might deposit the fallout east of the array.

To compensate for this expected change in shot-time wind the original station array was altered between 0400 and 0600 on shot day. Stations 24, 32, and 34 were moved to their final locations at the eastern ends of Lines 10 and 20. In the short time available to move the three stations, only the GITR's (Section 2.3) and the fallout collection trays were moved to the new locations and set up, as will be described later.

Table 2.1 presents data on the final station array. It should be noted that ground zero was not visible from 11 of the 16 stations because of the roughness of the terrain, a fact that contributed to uncertainties in estimating initial radiation. The elevation above ground zero at each station was measured with a standard aircraft altimeter to an accuracy of ± 10 feet. Elevations of Stations 24, 32, and 34 were not measured at their final locations.

2.3 INSTRUMENTATION

Several instruments were used at each of the 16 station locations for the determination of fallout charac-

teristics. Primary instruments were the always-open (AO) collector trays which retained fallout samples for post-shot analysis, and Gamma Intensity Time Recorders (GITR's) which provided dose rate and dose-versus time records. Secondary instruments to substantiate GITR data were self-reading pencil dosimeters placed with each GITR to record total dose accumulated to time of recovery, and radiac survey meters carried by the recovery crews, which measured dose rates at recovery time for each station.

2.3.1 Basic Fallout Collectors and Platform (Figure 2.2). The basic always-open fallout collector (AO) was a #16 gage aluminum tray 24 inches by 24 inches by 2 inches deep. An insert of venetian-blind louvers, especially developed for Operation Sun Beam by NRDL (described in Appendix B) was provided to eliminate bounce-out of large particles and minimize the loss of fine particles by the creation of dead-air cells in the tray. The cover, employing a sponge-rubber gasket, provided a dust-tight closure during transport from the fallout-collecting station to the sample-analysis laboratory.

The wooden platform supporting the basic collector trays was 10 feet by 12 feet by 6 inches, leveled and oriented with the 12-foot edges in a north-south direc-

tion. The top surface of the platform was 1/2-inch-thick Douglas fir plywood with a recess at the center of the north half (downwind and away from ground zero) to receive a standard NRDL open-close collector. Around the outer rim of the platform was a 2-inch-high sheet-metal angle enclosing a 2-foot-wide zone of dummy louver sections, similar to the tray inserts mentioned above. This dummy section, together with the inserts in the collection trays, eliminated edge effects and presented a uniform louvered surface, opening toward ground zero. Only the center portion (with trays) was used for the actual collection of material for analysis. Each of the trays was held firmly to the platform in its proper location by four spring holddown hooks screwed into the platform. Normally, ten trays were used plus the open-close collector, but in this case one tray was deducted for Sedan-event collection and the open-close collector was not available because of previous commitments to Project 2.9, Shot Small Boy. This left a total of nine trays per station which were arranged to fill all the spaces except the northwest corner position and the open-close collector recess. The trays were numbered 1 through 9 starting with 1 at the southeast corner of the 3 x 4 tray array. The first row had Trays 1, 2, and 3; the

second row had 4, 5 and 6 behind 1, 2, and 3, respectively; the third row had 7 and 8 behind 4 and 6; and the fourth row had only one tray, No. 9, behind 7.

Stations 24, 32, and 34, which were relocated during the 0400 to 0600 period on shot day, consisted of nine collector trays in a square array in the center of an 8-foot square panel of hardboard laid on the ground to conform with the terrain. They were not level, did not have the dummy louver border, and the trays were not held down. But, as with the unmoved stations, the trays were oriented so that the louvers opened upwind toward the south and ground zero. They were numbered from east to west as above in three rows from south to north: 1, 2, and 3; 4, 5 and 6; and 7, 8, and 9.

<u>2.3.2 GITR Description and Installation</u>. The NRDL Gamma Intensity Time Recorder (GITR) Model 103 (Reference 2) (Figure 2.3) is a self-powered device consisting of a detector unit and a recorder unit. The detector unit consists of two concentric ionization chambers with associated recycling electrometers. During this operation, the detector unit was mounted inside the case. A given increment of gamma-radiation dose discharges the ionization chamber and causes the electrometer to send a pulse to the recorder

and to recharge the ionization chamber. The pulses are recorded as on-off information on two channels (high and low range) of magnetic tape while a timing pulse is recorded on a third tape channel. A suitable readout mechanism is used to superimpose the data and time channels and provide dose rate and integrated dose versus time.

The GITR's were placed 10 to 30 feet from the collector platforms at each station. At six of the stations close to ground zero the GITR's were fully shock-mounted. At the remainder of the stations the GITR's were tied on wood platforms wired to metal stakes. Direct-reading pocket dosimeters (200-r and 600-r range) were placed inside each GITR case to determine, qualitatively, if radiation was received.

The starting signal for the GITR's was provided by Edgerton, Germeshausen, and Grier (EG&G) at minus 30 seconds through a hard-wire connection. Station 24, 32 and 34 GITR's, which were relocated shortly before shot time, were manually started at 0559 hours on shot day by the three teams which relocated and armed the stations.

2.4 OPERATIONS IN THE FIELD

Field operations involved preshot preparation of fallout collectors and instrumentation and prompt postshot recovery of fallout samples for analyses before radioactive decay diminished their value as a source of data. Laboratory equipment in the field was essential for the radiological assessment of each sample recovered and to perform certain analyses that could not wait until the samples were returned to NRDL.

2.4.1 Preshot Operations. The basic collector trays were installed on the platform by D-2. No covering for the trays was provided because the soil was well stabilized and the access roads were far enough removed so there was minimal preshot debris collection in the trays. The tray covers and cover clips were stored in a ten-tray box at each station downwind from the platform. The box was wrapped in polyethylene sheeting to minimize contamination of the sample processing area after recovery.

The GITR's were checked and armed between 0300 and 0600 on shot day. The self-reading pocket dosimeters were zeroed and a final readiness check of each station was made. Stations 24, 32, and 34 were moved as described above.

2.4.2 Postshot Recovery. Using early-time radiation-

survey information obtained by other projects as a guide, initial penetration of the radiation area was made from the west side of the array at Station 22 at 1600 hours on shot day. One recovery team was able to recover sample trays at Stations 22, 20, and 30 before being obliged to leave the radiation area and in order to remain within prescribed radiation dose limitations. Having established the general radiation intensities for the area, additional recovery teams were able to collect sample trays from Stations 01, 02, 12, 14, 24, 32, 33, and 34 for a total of eleven stations recovered on shot day. Because of high radiation levels, the remaining stations were left to decay further before recovery.

On D+1 day, sample trays at Stations 13, 21, 23, and 31 were recovered for analysis, but the sample radiation level was too high (over 4,000,000 counts/min) for immediate gross counting of the trays. The GITR's were recovered from all stations but 11, 13, and 21 on D+1 day. The recovery of sample trays at Station 11 and the three remaining GITR's was made on D+6. All samples and GITR's recovered were returned to the field laboratories for analysis and evaluation.

Arrangements were made with Los Alamos Scientific Laboratory (LASL) to obtain cloud samples from B-57 air-

craft operating from Indian Springs Air Force Base. One quarter of the total of each of two samples obtained from cloud penetrations at 11,000- and 14,000-foot altitudes at H+20 minutes was returned to NRDL for complete radiochemical analyses. Swatch samples from the cloud, obtained at 12,000 feet at H+48 minutes and 13,700 feet at H+54 minutes, were used for particle studies.

2.4.3 Analytical Equipment. Extensive laboratory facilities were set up in trailers at the NTS Control Point Number One where all the recovered samples were returned for counting and physical and chemical analyses. The more important pieces of equipment are described below.

Two types of radiation counters were used to measure the amount of radiation present in the recovered samples. The first type, colloquially known as a cathouse counter, was a chamber large enough to accept the 24-inch collector trays and had two inches of lead shielding on all sides. Radiation from the sample was detected by a thallium-activated sodium-iodide scintillation crystal, 1-1/2 inch diameter and 1-inch thick, mounted in the top face of the chamber about 3 feet above the sample tray. Pulses from a photomultiplier tube coupled to the crystal were preamplified and registered by a Systron scaler during the counting-

time period. All readings were normalized to a standard response of 32.100 counts/min for 100 μg of radium on the floor of the counter. This standardization permitted direct application, if desired, of the calibration data for a similar counter reported in Reference 3 (Operation Redwing).

The second type of counter used was a 4-pi high-pressure-gas ionization chamber (Reference 4) which accepted samples of 50-cc maximum volume in a 1-1/2 inch O.D. test tube. Radiation from the sample was detected by a 988-in^3 chamber of high-pressure (600 psi) argon gas surrounding the thimble containing the sample. Suitable electronics was provided to measure the current produced and a 100-μg radium standard was used to correct sample readings to a common base for comparison.

Throughout all counting procedures, care was exercised to preserve low-background count by isolation of the counter from the sample storage area and by packaging of samples to prevent contamination of the counter.

Physical properties of the samples were determined by standard sieving techniques using selected sizes of sieves on a RoTap[1] machine. Laboratory balances were used to find

1. Manufactured by W. S. Tyler Co., Cleveland, Ohio.

weight-size relationships and the 4-pi ion chamber was used to measure radioactivity-size relationships of the sieved fractions. A thermally insulated water-settling column was used to determine subsieve particle size distributions. Samples drawn from a homogeneously mixed suspension in the column of a known amount of subsieve (< 44 μ) fallout particles at predetermined times corresponding to known particle-size settling rates were centrifuged, dried and weighed.

A chemistry laboratory in one trailer was available for fallout solubility and leaching studies. Results of these studies were determined from 4-pi ionization-chamber measurements.

2.4.4 Sample Analysis. The following procedures of sample processing and analysis were used:

(1) All the basic collector trays recovered from the field were gross-counted in the cathouse counter. This provided a preliminary assessment of the sample activity.

(2) One tray from nearly every station was set aside as a gross decay sample and counted periodically in the cathouse counter.

(3) Depending upon the station and the amount of activity and mass in an individual tray, the material from a single or combined trays for each of many stations was brushed out. It was then weighed and dry-sieved on a Rotap

machine, using a nest of standard sieves. Each individual size fraction was weighed and then measured in the 4-pi ion chamber to give mass-particle size-activity relationships.

(4) The dry-sieved fractions from one tray at one station were measured in the 4-pi ion chamber as decay samples. A second tray from the same station was decay counted in the cathouse counter.

(5) Selected material from some stations was wet-sieved and the particle size distribution of the less-than-44-micron material was determined by a water-column settling technique. The greater-than-44-micron material was dry-sieved, weighed, and measured in the 4-pi ion chamber.

(6) Some of the early recovered samples were analyzed with a gamma-ray spectrometer to determine the relative abundance of short half-life isotopes.

(7) Samples from some stations were wet-sieved and two particle sizes were leached in pH 1 HCl solutions, pH 6 distilled H_2O, and pH 10 NaOH solutions for different periods of t[illegible] Similar samples were mixed with water and adobe, or w[illegible] and montmorillonite clay, and allowed to stand for d[illegible]erent periods of time to study the extent of desorption [illegible] fission products from fallout particles.

2.5 ANALYSIS OF SAMPLES RETURNED TO NRDL

Fallout from 13 basic collector trays in the highest radiation area was returned promptly to NRDL for particle and radiochemical studies. Fallout from 4 collectors was size-separated into 9 or 10 fractions. The remainder were not sieved.

Of the 4 samples which were sieved into fractions, 13 pan fractions were sent to Tracerlab, Inc., for complete radiochemical analyses (17 nuclides) and 23 fractions were sent for partial radiochemistry (4 nuclides). (See Appendix C.) Eight gross samples were also sent for partial radiochemical analysis and two cloud samples received from LASL received complete radiochemical analysis.

Stanford Research Institute (SRI) conducted particle studies on one gross sample and two cloud samples.

Appendix C shows the disposition of all the samples returned from the field for radiochemical analysis.

Samples analyzed in the field (Section 2.4.4) and field laboratory equipment (Section 2.4.3) were ultimately (D+30 days) returned and stored at Camp Parks, California, where analyses and decay measurements were continued.

2.6 DATA REDUCTION

Fallout sample analysis data obtained at the test site and at Camp Parks was transcribed to punched cards for manipulation, and final tabulated IBM machine printouts are included in this POR. Cathouse counter and 4-pi ionization-chamber raw data are tabulated in Appendix D. Corrections applied to the raw data include background, instrument response and decay correction to a common time of H+100 hours, for comparative purposes.

2.6.1 Processing of Dose-Rate Data.

The gamma-dose increments recorded on the GITR magnetic tapes were converted at NRDL to punched tape readout by an electronic data-reduction system that measured the time interval between dose increments (Reference 5). The punched tape in turn was converted to IBM magnetic input tape by a data translator. This input data, along with calibration corrections, was then processed by NRDL's IBM-704 computer to provide printouts of dose-rate histories and accumulated doses. The printout data was then examined and culled of anomalies. The first few seconds of recorded data were also converted onto oscillograms so that this data could be examined in detail. Finally, the printout and oscillograms were resolved to provide continuous dose-rate data with respect to accurate time.

The instrumentation employed did not record the initial radiation and an estimate of its contribution to the total dose is not possible. This is because in cases where ground zero was visible from the station, instrument saturation made the value uncertain. From stations where ground zero was not visible there was an additional effect due to the attenuation of initial radiation by the terrain.

2.6.2 Support From Other Projects. To increase data-reduction efficiency and to provide a uniform presentation of data from several events, a joint effort by Johnie Boy Project 2.9, Small Boy Projects 2.9, 2.10, and 2.11, and Sedan Project 62.90 was initiated. This effort permitted considerable specialization in handling certain types of data common to all the events and resulted in an overall saving in time and manpower.

machine, using a nest of standard sieves. Each individual size fraction was weighed and then measured in the 4-pi ion chamber to give mass-particle size-activity relationships.

(4) The dry-sieved fractions from one tray at one station were measured in the 4-pi ion chamber as decay samples. A second tray from the same station was decay counted in the cathouse counter.

(5) Selected material from some stations was wet-sieved and the particle size distribution of the less-than-44-micron material was determined by a water-column settling technique. The greater-than-44-micron material was dry-sieved, weighed, and measured in the 4-pi ion chamber.

(6) Some of the early recovered samples were analyzed with a gamma-ray spectrometer to determine the relative abundance of short half-life isotopes.

(7) Samples from some stations were wet-sieved and two particle sizes were leached in pH 1 HCl solutions, pH 6 distilled H_2O, and pH 10 NaOH solutions for different periods of time. Similar samples were mixed with water and adobe, or water and montmorillonite clay, and allowed to stand for different periods of time to study the extent of desorption of fission products from fallout particles.

2.5 ANALYSIS OF SAMPLES RETURNED TO NRDL

Fallout from 13 basic collector trays in the highest radiation area was returned promptly to NRDL for particle and radiochemical studies. Fallout from 4 collectors was size-separated into 9 or 10 fractions. The remainder were not sieved.

Of the 4 samples which were sieved into fractions, 13 pan fractions were sent to Tracerlab, Inc., for complete radiochemical analyses (17 nuclides) and 23 fractions were sent for partial radiochemistry (4 nuclides). (See Appendix C.) Eight gross samples were also sent for partial radiochemical analysis and two cloud samples received from LASL received complete radiochemical analysis.

Stanford Research Institute (SRI) conducted particle studies on one gross sample and two cloud samples.

Appendix C shows the disposition of all the samples returned from the field for radiochemical analysis.

Samples analyzed in the field (Section 2.4.4) and field laboratory equipment (Section 2.4.3) were ultimately (D+30 days) returned and stored at Camp Parks, California, where analyses and decay measurements were continued.

2.6 DATA REDUCTION

Fallout sample analysis data obtained at the test site and at Camp Parks was transcribed to punched cards for manipulation, and final tabulated IBM machine printouts are included in this POR. Cathouse counter and 4-pi ionization-chamber raw data are tabulated in Appendix D. Corrections applied to the raw data include background, instrument response and decay correction to a common time of H+100 hours, for comparative purposes.

2.6.1 Processing of Dose-Rate Data.

The gamma-dose increments recorded on the GITR magnetic tapes were converted at NRDL to punched tape readout by an electronic data-reduction system that measured the time interval between dose increments (Reference 5). The punched tape in turn was converted to IBM magnetic input tape by a data translator. This input data, along with calibration corrections, was then processed by NRDL's IBM-704 computer to provide printouts of dose-rate histories and accumulated doses. The printout data was then examined and culled of anomalies. The first few seconds of recorded data were also converted onto oscillograms so that this data could be examined in detail. Finally, the printout and oscillograms were resolved to provide continuous dose-rate data with respect to accurate time.

The instrumentation employed did not record the initial radiation and an estimate of its contribution to the total dose is not possible. This is because in cases where ground zero was visible from the station, instrument saturation made the value uncertain. From stations where ground zero was not visible there was an additional effect due to the attenuation of initial radiation by the terrain.

2.6.2 Support From Other Projects. To increase data-reduction efficiency and to provide a uniform presentation of data from several events, a joint effort by Johnie Boy Project 2.9, Small Boy Projects 2.9, 2.10, and 2.11, and Sedan Project 62.90 was initiated. This effort permitted considerable specialization in handling certain types of data common to all the events and resulted in an overall saving in time and manpower.

TABLE 2.1 STATION ARRAY DATA

Ground Zero Location: Area 18 NTS
Nevada State Coordinates: N863, 641.75 E 597,266.63
Geodetic Position: Latitude : N37 Degrees 07' 20.0852"
Longitude: W116 Degrees 19' 58.9562"
Surface Elevation: 5153.52 feet

Station	Visible From GZ	Elev. Above GZ ft	Bearing from GZ	Distance From GZ ft
01	No	20	65°00'	1200
02	No	40	245°00'	1200
11	Yes	40	1°34'	1342
12	Yes	60	308°26'	1342
13	No	60	31°19'	2163
14	No	40	278°41'	2163
20	Yes	70	335°00'	2400
21	No	90	7°00'	2830
22	Yes	140	303°00'	2830
23	No	100	26°20'	3842
24	No	-	52°14'	5434
30	No	150	335°00'	4000
31	No	150	7°00'	4717
32	No	-	40°38'	5818
33	Yes	220	26°20'	6403
34	No	-	45°10'	3512

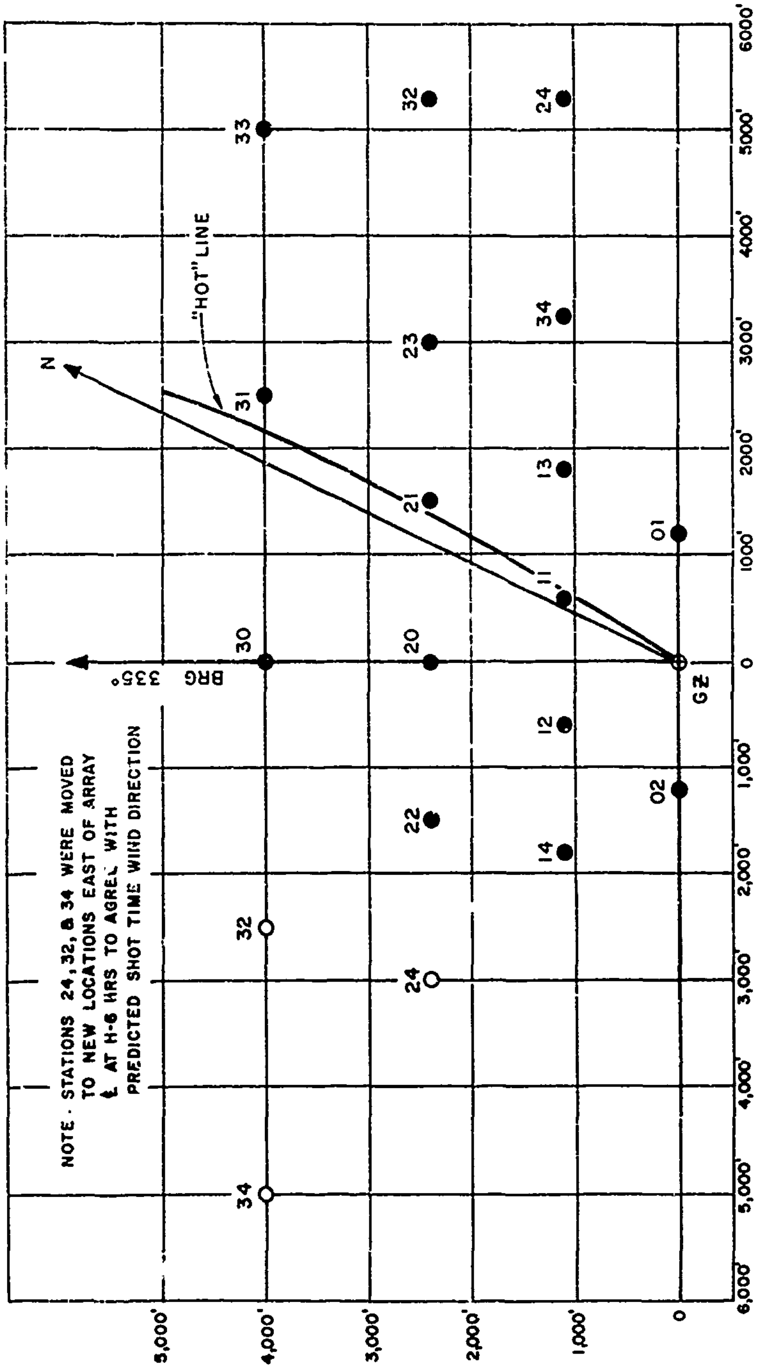

Figure 2.1 Station array showing hot line.

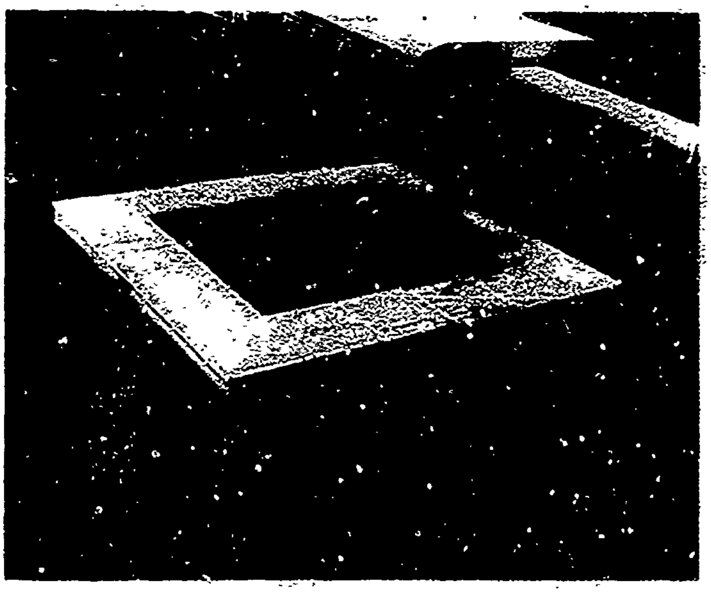

Figure 2.2 Station platform complete with collector trays and open-close collector. (NRDL 500(L)-4-62)

Figure 2.3 NRDL Model 103 standard GITR with cover off showing tape-transport mechanism. (NRDL 514(L)-4-62)

CHAPTER 3

RESULTS AND DISCUSSION

The placement of fallout collectors within the fallout pattern was successful to the unprecedented extent that all stations in the array received measurable amounts of radiation from deposited fallout. Some instrumentation malfunctioned and some fallout collectors received insufficient mass for reliable analysis. Nevertheless a large amount of data was obtained by the limited manpower available to this project.

3.1 PREDICTED AND OPERATIONAL RESULTS

In accordance with plans mentioned in Section 2.1 the wind structure above surface zero at 0925 hours on shot day (H-20 minutes) was telephoned to NRDL for a computer solution of the NRDL D Model to give fallout pattern prediction. The pattern prediction was received within 2 hours after shot time to permit its use in planning recovery of samples. The shot-time wind structure used is reported in Table 3.1. The radiation intensities computed for this set of conditions are shown in Table 3.2. Decay-corrected AN/PDR-39 (T1B) survey-meter readings made by sample-recovery teams and H+1 hour dose rates recorded by GITR's are also compared. GITR dose rates are standard intensities because completion of

fallout deposition had occurred by H+1 hour. A comparison of the standard intensity values shows consistency near the hot line at Stations 11, 21, and 31. The number of stations at which no fallout was predicted (N.F.) indicates a need for minor improvements in the fallout model prediction system. Most GITR measurements show reasonable agreement with TIB measurements corrected for fission-product decay.

The model-predicted radiation-intensity values were used for overall planning of the recovery operations but early survey data from Project 2.8 (Reference 6) and monitoring by the NRDL recovery teams ultimately determined the pace and sequence for individual station recovery.

The compactness of the station array and its proximity to ground zero in a downwind sector assured some fallout collections and radiation dose rates at each of the 16 stations. Of the 16 GITR's used, 11 operated normally, 4 operated so that special data-reduction techniques could be used to recover some data, and only 1 (Station 13) provided no usable data because of GITR malfunction. Fallout samples were recovered from all stations, but analysis effort was concentrated on those receiving large amounts.

One notable feature of the fallout pattern was a visual manifestation of the hot line which was characterized by a narrow (50-to 100-foot wide) band of large (mm range) black

fused particles. This band extended approximately north from ground zero through Station 11 and between Stations 20 and 21 and Stations 30 and 31. The existence of this band was readily apparent to the recovery teams when crossing it. Off-scale readings were indicated throughout this band on the radiation-monitoring instrument carried by each team. This hot line is indicated on Figure 2.1 and additional information is available in Reference 7.

Considerable physical damage was inflicted by blast on the sample trays at Stations 01, 02, 11 and 12 in the 5-psi overpressure range. The damage consisted mainly of ejection of the louver inserts from the trays and an occasional tray blown clear of the platform. Station 01 suffered the most severe damage as evidenced by the loss of all buffer louvers and by platform deck collapse. The sample-tray wood storage box was pulled apart and some of the tray lids inside were bent, but not beyond usefulness. Despite the physical damage to the platforms, most of the sample trays were recovered sufficiently intact from all stations to obtain representative samples. All the GITR's easily survived the shock wave, indicating that they were adequately protected by shock mounting or, where applicable, were distant enough not to require shock mounting.

Blast damage assessment at the collector stations was not one of the objectives of the project. However, several weaknesses in the use of the collector for close-in fallout were noticed. The louver inserts were not fastened in the trays and were ejected by the blast. Since this happened before the arrival of fallout, their planned use to retain the large fallout particles was never realized. Although some trays were blasted from the platform, it appears that generally the spring hold-down clips were strong enough to hold the trays. Poor installation led to [illegible] [illegible]s. In spite of the moderate damage suffered, samp[illegible] and data were still obtained, and the experiences gained led to installation improvements in the collectors used for Small Boy Project 2.9.

An event unprecedented in fallout sampling occurred at Station 11. Molten fallout resembling lava splattered in and blackened the surface of the aluminum collector trays. This was because the station was directly on the hot line as indicated in Figure 2.1 and very close (1342 feet) to ground zero.

3.2 SAMPLE ANALYSIS

Results of sample analysis procedures described in Sections 2.4.1 [illegible] are presented in this section. They represent a [illegible] effort by personnel who were committed to the suppor[illegible] [illegible]all Boy. At early times after Shot Johnie Boy

on July 11, 1962 when ample analytical support was available, some difficulties were experienced in development of smoothly running analytical procedures. In addition, some samples could not be recovered or handled due to high levels of radioactivity. From July 14 on, when Shot Small Boy samples received the highest priority for analysis, Johnie Boy samples received minimal attention at NTS. However, selected samples returned to NRDL for radiochemical analysis and particle study received a more thorough analysis, as the results attest. Radiation measurements obtained in the 4-pi ionization chamber and the cathouse counter are presented in Tables 3.3 through 3.6. Basic field measurements are presented in Appendix D.

3.2.1 Activity Analyses. Gross counts were made in the cathouse counter of all collectors recovered to assess radioactivity levels and to determine disposition of the samples for analysis. Stations 13, 24, 33, and 34 received fallout in amounts too small for analysis (counts less than twice background) so these samples were discarded. Collectors from Stations 11, 21, and 31 near the hot line contained so much activity ($> 4 \times 10^6$ c/m) that they couldn't be counted until the seventh day.

Table 3.3 summarizes all gross scintillation-counter

and mass measurements. For comparison purposes the observed net count rates in the cathouse counter were corrected to an arbitrary time of H+100 hours using the decay curve of Figure 3.1. The empty collector activity is shown as an aid to future determination of the total mass of fallout in the collectors.

The recovered weight is tabulated next. A zero in the empty-collector column indicates the empty-collector activity is available, but no weight. A zero in both empty-collector and weight-recovered columns indicates the debris was not removed from the collector. Much empty collector data was lost because of cross contamination.

The activity and mass concentrations per unit area and the specific activity columns are the result of straightforward computations. The final column, estimated fissions/ft^2, was obtained by multiplying the activity concentration by the constant 4.76×10^8 fission/counts/min at H + 100 hrs. The relation is derived in Reference 3 for unfractionated thermal fission products of U^{235}.

Table 3.4 summarizes the mass and activity distribution related to particle size. A "T" after a sample number indicates a total sample from which the succeeding micron sizes are sieve openings through which each fraction of

material will not pass. A "W" indicates the sample was wet-sieved. The mass column gives the total weight of each sample followed by the weights of individual sieve fractions. Activity measured in the 4-pi ionization chamber and corrected to H+100 hours using the decay curve of Figure 3.2 is given in a manner similar to the mass measurements. Cumulative distribution by percent less than the stated size is given for both mass and activity and the specific activity is the straightforward computation of activity divided by mass. Inspection of the specific activity (ma/g) column in Table 3.4 reveals two peaks of high specific activity, one in the large sizes (1410-2830 microns at close-in stations, and 710-1410 microns at more distant stations) and a lesser peak in the subsieve size ranges (< 44 microns).

3.2.2 Decay Curves and Measurements. Figures 3.1 and 3.2 show, respectively, the decay curves for the cathouse counter and 4-pi ion chamber used to correct the data to the common time of H+100 hours. The cathouse-counter decay curve is a composite curve fitted to individual decay curves of samples from Stations 01, 02, 12, 30, and 31. The 4-pi ion-chamber decay curve was obtained by combining individual decay curves of 9 sieve fractions from Station 01.

Tables 3.5 and 3.6 show both observed and decay-

corrected H+100-hour values of data used in the determination of the composite decay curve for the cathouse and 4-pi ionization chamber respectively. The constancy of the H+100-hour values of each sample is an indication of the accuracy with which the composite decay curve fits the observed values. The poorest fit of a composite decay curve to the data occurs at early time (< 0.500 days), which may affect the H+100-hour gross-count values computed from early-time observations and presented in Table 3.3.

Decay measurements were made on selected samples for periods of as long as 226 days. All decay measurements were made in the 4-pi ionization chamber, with the early time (to 21 days) values being determined at NTS and later at Camp Parks, Calif., where the samples are now stored. Table 3.7 gives decay information for cloud sample #837L which was taken at 13,500-foot altitude at H+34 minutes. From collector 21A01 gray, fused, sintered, and white particles were selected visually and separately decayed as shown in Table 3.8. From collector 31A04 gray, fused, sintered, and white particles and 1 gram and 22.5 gram gross samples were separately decayed as summarized in Table 3.9. These decay data, together with spectral data, can be used to determine correlation, if any, between physi-

cal, chemical and radiological properties of fallout.

3.2.3 Sieve Analyses, Leaching and Exchange Studies. Five preshot soil samples from ground zero and vicinity were obtained on the surface and from excavations for other projects. Because the alluvial soil contained large pebbles and gravel only the material that passed through a 1/4-inch-mesh screen was analyzed. Twenty-gram samples of minus-1/4-inch material were dry sieved and the subsieve material ($< 44\ \mu$) was wet-sieved using a water-settling column technique. The results of the analyses of the five preshot samples are given in Table 3.10.

Postshot fallout sieve analyses from selected collectors are shown in Table 3.4. A significant change observed is the shift to a predominance of larger particles after the shot. The minus-44-micron material decreased from an average of 24 percent to 11.5 percent.

Leaching of gamma-emitting radionuclides from fallout particles in gross samples and selected sieved fractions in solutions of pH 1 HCl, pH 6 water and pH 10 NaOH was determined. Aliquots of these fallout samples were added to 25 ml of solution in centrifuge tubes and left for 1 hour and 1- 3-and 7-day periods. The tubes were then centrifuged, the liquid was decanted. Both the dried solid and liquid

fraction radioactivity was measured in the 4-pi ionization chamber. The results of these studies are presented in Tables 3.11 and 3.12. Leaching was generally greater for longer time periods and for pH 1 (HCl) solutions. Fused particles showed less leaching (by factors of 10 to 50) than other selected characteristic particles. This indicates a lack of surface activity and that physical state probably has a great influence on solubility of radionuclides.

The exchange of gamma-emitting radionuclides from fallout particles to montmorillonite clay and adobe soil was measured. Ten grams of minus-44-micron clay or adobe was mixed intimately with plus-44-micron fallout particles in 25 ml of distilled water, left for a 1- 3-or 7-day period, and physically separated by washing the clay or adobe through a 44-micron screen. The fallout particles [illegible]ained on the screen and the clay or adobe were each [illegible]ed in the 4-pi ionization chamber. Results of the e[illegible]ange studies presented in Table 3.13 show generally higher exchange of radioactivity for montmorillonite clay (0.5 to 51.2 percent) than for adobe soil (0.4 to 19.4 percent). As with leaching, physical state seemed to have an effect on activity exchange rates.

3.2.4 Radiochemical Analyses. Results of radiochemi-

cal analyses of samples returned to NRDL and treated as indicated in Appendix C were obtained in terms of R-values and equivalent fissions per gram of sample.

The R-value of a radionuclide is defined as the ratio of the number of atoms of this nuclide to the number of atoms of a reference radionuclide (usually Mo^{99}) in a sample divided by the same ratio for thermal neutron fission of U^{235}. R-values are useful indices of radionuclide fractionation. Radionuclides which do not separate from the reference substance have values characteristic of the type of detonation. Enrichment or depletion are manifested by positive or negative deviations from the characteristic value. Radiochemical R-values of the fission products are given in Table 3.14 (References 8 and 9).

Equivalent fissions per gram were calculated for each radionuclide using fission yields characteristic of this detonation. These yields were estimated on the basis of theoretical information supplied by LASL. The yields used were those experimentally determined by LASL (Reference 10) or taken from the estimations of Weaver, Strom and Killeen (Reference 11). Tables 3.15 and 3.16 show equivalent fissions per gram for the various samples analyzed. The cloud samples were not weighed so the values given are

fissions per total sample.

3.2.5 Particle Studies. Four tubes of the gross material collected at Station 11 and two cloud-swatch samples were used for detailed particle studies. Slides of representative material were prepared for microscopic examination of the gross samples, and for particle size measurements.

Only the Station 11 samples consisted of sufficiently wide particle-size ranges and sample sizes to justify separation by screening. Table 3.17 summarizes the results of particle studies on the four samples; Figure 3.3 shows the distribution of particle weight; and Figure 3.4 shows the cumulative particle-size distribution. Although 70 to 79 percent of the weight was associated with pebbles greater than 1000 μ in diameter median, diameters ranged from 29 to 55 μ, and 98 percent of the particles ranged from 5 to 400 μ.

The particles were principally light gray to dark gray pebbles. Activity was present only in inorganic material, and was associated almost entirely with quartz. A large number of particles, particularly among the pebbles, consisted of partially active glassy, vesicular material; active glassy coatings on inactive alluvial material; and inactive, alluvial coatings on active, glassy material.

Photomicrographs and autoradiographs of mounted particles show the presence of discontinuous glass coatings on inactive particles, active vesicular particles, and several active particles with inactive coatings (Figure 3.5 and 3.6).

There was a general trend toward an increase in the percentage of radioactive particles with an increase in particle size (Table 3.17). In the four samples, 0 to 2 percent of the particles were active in the less-than-200-micron size range. Fifty percent of the particles were active in the 200-to 500-μ size range. Approximately 25 to 50 percent of the particles larger than 530 μ were active.

A uniform distribution of activity throughout the particle was observed in the active particles up to a size of about 530 μ. Activity in larger particles was associated with partially active, glassy vesicular material, active glassy coatings on inactive material, and a few particles with inactive coatings on active, glassy material.

The particle density range was 1.50 to 2.70 g/cc and the predominant crystal structure, determined by X-ray diffraction, was alpha quartz. The emission spectrography results are shown in Table 3.18 indicating 41-to 77-percent silicon by weight. No ferromagnetic material was found in any of the samples.

The characteristics of the cloud samples are summarized in Table 3.18 and 3.19 and Figure 3.7. About 90 percent of the material was active over the entire particle size range with the activity uniformly distributed through the particles. No magnetic material was found in the samples.

3.2.6 Gamma Ray Spectra. Figures 3.8 and 3.9 are plots of pulse-height distributions of several samples obtained with Penco 100-channel and TMC 400-channel analyzers. The plots are arbitrarily positioned vertically on a logarithmic relative count-rate scale to permit comparison of curve shapes and still give relative values of the energy peaks of the individual curves. The salient elemental energy peaks have been identified for correlation with the channel numbers. No attempt has been made to unfold these pulse-height distributions, although a computer program is available at NRDL, should absolute photon frequencies be required. Details of the measurements and other pertinent information may be found in Reference 12.

Representative spectra for Stations 01, 12, and 30 are shown in Figure 3.8. Virtually identical plot shapes were obtained from all samples from the same station. The peaks at Channel 70 are due to additional instrument

response to Na^{24} (2.75 Mev) gamma rays. No explanation is apparent for the differences in relative amounts of Na^{24} and fission products in the samples or for the appearance of the Ba^{140}-La^{140} peak at two of the three stations at the same time after detonation.

Figure 3.9 gives spectra plots of a gross sample and selected characteristic particles from Collector 21 A01. The gamma ray spectral identity of the gross sample and fused, sintered and gray particles indicates that the material of different physical characteristics can have the same radiological properties. This fact adds information to the concepts of radionuclide fractionation by condensation as the fireball cools.

The predominance of Na^{24} in all Johnie Boy samples was unique in comparison with Small Boy and Sedan samples. This is probably explained by the presence of 20 pounds of aluminum and 72 pounds of magnesium in the weapon and its partial burial (-23 inches) in the soil. This combination could have led to a high couplin[illegible] ([illegible]early 4-pi) of the neutron flux with these elements [illegible]ng Na^{24} either by the reaction Mg^{24} (n,p) Na^{24} which has a 39-mb cross section at the 2.1-Mev energy threshold and/or Al^{27} (n,α) Na^{24} which has a 3.14-Mev energy threshold and an 11-mb cross section for 6-Mev

neutrons. Without such materials present to combine with the crater soil and become part of the fallout material, a high Na^{24} content would not be observed. This was substantiated in Shot Sedan which also had a 4-pi coupling with the soil. Analysis of its fallout material shows only a very small quantity of Na^{24}. Additionally, results from previous weapons tests (Reference 13) indicate that the 1 to 4 percent sodium normally present in Nevada soil is not enough to produce the Na^{24} seen in the Johnie Boy spectra.

3.3 DOSE RATE AND DOSE HISTORIES

Figures 3.10 and 3.11 show dose rate and accumulated dose histories for the 14 stations where the GITR data could be interpreted. Tables of values from which the curves were plotted are given in Appendix A.

The dose-rate history curves of Figure 3.10 show time and radiation intensity relationships among the stations in the array. Stations 11, 21, 31, 30, and 33 show three well-defined phases of the dose-rate history: (1) the decay of the high initial radiation at early times (.01 to .07 hours); (2) the rapid increase of dose rate as fallout arrives; and (3) the radioactivity decay of the deposited fallout. Stations 02, 20 and 23 show poorer definition of the phases of the dose-rate history because their proximity to ground

zero (or the hot line) provides a high transit dose rate which masks the change in dose rate due to the arrival of the deposited fallout. The similarity in slope of the curves beyond 0.1 hour indicates similar decay rates. The time phasing and relative intensity values of the GITR dose-rate histories is consistent with an analysis of the array configuration relative to wind direction, ground zero, and hot-line location.

The dose-history curves of Figure 3.11 show time and accumulated dose relationships among the stations in the array. It was not possible to estimate or record initial dose because of instrument saturation or because of shielding by the rough terrain. For these reasons the absolute dose values shown may be inaccurate by more than the first value given after the arbitrary real time when accumulated dose tabulation was started. Therefore the dose-history curve shapes should be interpreted in a qualitative manner in describing the fallout event by a characteristic rapid dose buildup as fallout arrives, followed by a leveling off, after cessation of fallout where radioactive decay accounts for continually decreasing amounts of additional dose in a given time.

The pencil dosimeters used as secondary instrumentation served no useful purpose in helping to establish absolute dose value so their readings have been discarded. The dose accumulated between H+1 hour and the time when the GITR tape stopped shows good agreement with values obtained by the methods in Section 2.1 of Reference 14.

TABLE 3.1 WIND STRUCTURE ABOVE SURFACE ZERO AT 0925 HOURS (H-20 Minutes) JULY 11, 1962

Surface zero at 5153-ft altitude.
Wind is from azimuth measured from true North

Altitude	Azimuth	Speed
ft	degrees	knots
5100	195	10
6000	170	7
7000	160	7
8000	180	11
9000	160	16
10000	170	15
11000	180	12
12000	180	15
13000	190	17
14000	200	21
15000	200	22
16000	200	22
17000	200	27
18000	200	27
19000	210	26
20000	200	23

TABLE 3.2 COMPARISON OF PREDICTED AND MEASURED STANDARD INTENSITIES

T1B readings, decay corrected by curve in Figure 2.3 of Reference 14

GITR values read directly from Figure 3.10

D-Model values by NRDL IBM 704 computer using winds of Table 3.1.

NF indicates no fallout predicted by D-Model

Station	Standard Intensity r/hr at 1 hr		
	T1B	GITR	D-Model
01	36.4	38	N.F.
02	7.2	8.4	N.F.
11	1173	1400	1828
12	10.3	-	N.F.
13	1.6	-	N.F.
14	0.63	-	N.F.
20	2.68	5.2	264
21	960	750	790
22	0.33	0.55	N.F.
23	-	1.5	N.F.
24	0.032	> 0.1	N.F.
30	2.62	3.2	81
31	160	130	253
32	0.056	0.27	N.F.
33	0.052	> 0.1	N.F.
34	0.662	0.80	N.F.

TABLE 3.3 GAMMA ACTIVITY AND GROSS MASS OF DEBRIS COLLECTED

SAMPLE NUMBER	ACTIVITY AT 100 HR (C/M)	EMPTY COLLECTOR ACTIVITY AT 100 HR (C/M)	WEIGHT RECOVERED (GRAMS)	ACTIVITY CONCENTRATION (C/M/SQ.FT)	MASS CONCENTRATION (GRAMS/SQ.FT)	SPECIFIC ACTIVITY (C/M/GRAMS)	ESTIMATED FISSION CONCENTRATION (FISSIONS/SQ.FT)
1 AO 1	683509.	0.	0.	170892.	0.	0.	0.8134E 14
1 AO 2	234361.	4438.	157.2000	58590.	39.3000	0.1491E 04	0.2789E 14
1 AO 3	171[illegible].	3642.	36.8000	42995.	9.2000	0.4672E 04	0.2047E 14
1 AO 4	113495.	0.	0.	28374.	0.	0.	0.1351E 14
1 AO 5	13[illegible].	0.	0.	33236.	0.	0.	0.1582E 14
1 AO 6	240365.	0.	0.	60091.	0.	0.	0.2860E 14
1 AO 7	231373.	5176.	-0.	57843.	-0.	0.	0.2753E 14
1 AO 8	971994.	3934.	-0.	242998.	-0.	0.	0.1157E 15
1 AO 9	44843.	0.	0.	11212.	0.	0.	0.5337E 13
2 AO 1	1543[illegible].	0.	0.	3858.	0.	0.	0.1836E 13
2 AO 2	150[illegible].	0.	0.	3764.	0.	0.	0.1791E 13
2 AO 3	771[illegible].	0.	0.	1929.	0.	0.	0.9180E 12
2 AO 4	12[illegible]04.	0.	30.9800	3026.	7.7450	0.3907E 03	0.1440E 13
2 AO 5	14713.	0.	0.	3678.	0.	0.	0.1751E 13
2 AO 6	1161[illegible].	0.	17.8500	2905.	4.4625	0.6509E 03	0.1383E 13
2 AO 7	3512.	0.	0.	878.	0.	0.	0.4179E 12
2 AO 8	12479.	0.	22.6600	3120.	5.6650	0.5507E 03	0.1485E 13
2 AO 9	7879.	0.	0.	1970.	0.	0.	0.9376E 12
11 AO 1	[illegible]448021.	0.	472.2500	13362005.	118.0625	0.1132E 06	0.6360E 16
11 AO 1	55409038.	0.	0.	13852260.	0.	0.	0.6594E 16
11 AO 1	24753[illegible]2.	0.	0.	10618848.	0.	0.	0.5055E 16
11 AO 2	54190549.	24683.	459.0000	13547637.	114.7500	0.1161E 06	0.6449E 16
11 AO 3	64411314.	0.	[illegible]	16102328.	140.8750	0.1143E 06	0.7665E 16
11 AO 5	88790278.	0.	813.6000	221[illegible].	2[illegible].4000	0.1091E 06	0.1057E 1[illegible]
11 AO 7	26388944.	0.	583.6000	6597236.	145.9000	0.452[illegible]E 05	0.3140E 16
12 AO 1	1884.	0.	0.	471.	0.	0.	0.2242E 12
12 AO 2	1978.	0.	0.	494.	0.	0.	0.2354E 12
12 AO 3	1987.	0.	0.	497.	0.	0.	0.2364E 12
12 AO 4	3040.	0.	0.	760.	0.	0.	0.3617E 12
12 AO 5	1907.	0.	0.	477.	0.	0.	0.2270E 12
12 AO 6	2730.	0.	0.	682.	0.	0.	0.3248E 12
12 AO 7	2118.	0.	11.6000	529.	2.9000	0.1826E 03	0.2520E 12
12 AO 8	26083.	0.	42.9000	6521.	10.7250	0.3080E 03	0.3104E 13
12 AO 9	3377.	0.	12.8000	844.	3.2000	0.2639E 03	0.4019E 12
13 AO 1	[illegible]	0.	0.	233.	0.	0.	0.1110E 12
14 AO 2	15[illegible].	0.	0.	39.	0.	0.	0.1854E 11
14 AO 3	1[illegible]7.	0.	0.	42.	0.	0.	0.1987E 11
14 AO 4	151.	0.	0.	40.	0.	0.	0.1916E 11
14 AO 5	1[illegible]1.	0.	0.	36.	0.	0.	0.1800E 11
14 AO 6	153.	0.	0.	38.	0.	0.	0.1618E 11

TABLE 3.3 GAMMA ACTIVITY AND GROSS MASS OF DEBRIS COLLECTED (CONTD)

SAMPLE NUMBER	ACTIVITY AT 100 HR (C/M)	DRIFT COLLECTOR ACTIVITY AT 100 HR (C/M)	WEIGHT RECOVERED (GRAMS)	ACTIVITY CONCENTRATION (C/M/SQ.FT)	MASS CONCENTRATION (GRAMS/SQ.FT)	SPECIFIC ACTIVITY (C/M/GRAM)	ESTIMATED FISSION CONCENTRATION (FISSIONS/SQ.FT)
14 AO 7	151.	0.	0.	38.	0.	0.	0.1799E 11
14 AO 8	154.	0.	0.	39.	0.	0.	0.1834E 11
14 AO 9	14[illegible].	0.	0.	37.	0.	0.	0.1776E 11
20 AO 1	7[illegible].	0.	0.	186.	0.	0.	0.8863E 11
20 AO 2	1369.	0.	0.	342.	0.	0.	0.1629E 12
20 AO 3	683.	0.	0.	171.	0.	0.	0.8126E 11
20 AO 4	17[illegible]5.	0.	5.3800	4499.	1.3450	0.[illegible]E 04	0.2141E 13
20 AO 5	1327.	0.	0.	332.	0.	0.	0.1579E 12
20 AO 6	1158.	0.	0.	290.	0.	0.	0.1378E 12
20 AO 7	12789.	0.	16.9500	3197.	4.2375	0.7545E 03	0.1522E 13
20 AO 8	871.	0.	0.	223.	0.	0.	0.1060E 12
20 AO 9	9645.	0.	0.	2411.	0.	0.	0.1148E 13
21 AO 1	[illegible]	0.	0.	6632161.	0.	0.	0.3157E 16
21 AO 2	155034[illegible].	0.	0.	3876[illegible].	0.	0.	0.1845E 16
21 AO 3	234161146.	0.	238.1100	5854029.	[illegible]	0.[illegible]E 05	0.2787E 16
21 AO 4	[illegible]	43947.	233.5000	8934162.	58.3750	0.1017E 06	0.2325E 16
22 AO 1	45.	0.	0.	11.	0.	0.	0.5346E 10
22 AO 2	42.	0.	0.	10.	0.	0.	0.4974E 10
22 AO 3	43.	0.	0.	11.	0.	0.	0.5173E 10
22 AO 4	44.	0.	0.	11.	0.	0.	0.5216E 10
22 AO 5	42.	0.	0.	10.	0.	0.	0.4988E 10
22 AO 6	41.	0.	0.	10.	0.	0.	0.4925E 10
22 AO 7	[illegible]	[illegible]	[illegible]	12.	0.	0.	0.5897E 10
22 AO 8	43.	[illegible]	[illegible]	11.	0.	0.	0.5153E 10
22 AO 9	4[illegible].	[illegible]	[illegible]	12.	0.	0.	0.5699E 10
23 AO 1	1574.	0.	0.	394.	0.	0.	0.1873E 12
23 AO [illegible]	[illegible]	0.	[illegible]	[illegible]	0.2103	0.2669E 04	0.2723E 12
23 AO 7	[illegible]	0.	1[illegible]	330.	0.3003	0.2100E 04	0.3001E 12
23 AO [illegible]	1718.	0.	1[illegible]	429.	0.2[illegible]	0.1692E 04	0.2044E 12
30 AO 1	2567.	0.	0.	642.	0.	0.	0.3085E 12
30 AO 2	639.	0.	0.	172.	0.	0.	0.8202E 11
30 AO 3	6416.	0.	0.	1604.	0.	0.	0.7635E 12
30 AO 4	1761.	0.	0.	440.	0.	0.	0.2095E 12
30 AO 5	5781.	0.	0.	1445.	0.	0.	0.6879E 12
30 AO 6	9672.	0.	0.	2418.	0.	0.	0.1151E 13
30 AO 7	263.	0.	0.	66.	0.	0.	0.3134E 11
30 AO 8	1735.	0.	0.	434.	0.	0.	0.2302E 12
30 AO 9	1316.	0.	0.	329.	0.	0.	0.1566E 12

SECRET

TABLE 3.3 GAMMA ACTIVITY AND GROSS MASS OF DEBRIS COLLECTED (CONTD)

SAMPLE NUMBER	ACTIVITY AT 100 HR (C/M)	EMPTY COLLECTOR ACTIVITY AT 100 HR (C/M)	WEIGHT RECOVERED (GRAMS)	ACTIVITY CONCENTRATION (C/M/SQ.FT.)	MASS CONCENTRATION (GRAMS/SQ.FT.)	SPECIFIC ACTIVITY (C/M/GRAM)	ESTIMATED FISSION CONCENTRATION (FISSIONS/SQ.FT.)
31 AO 1	[illegible]	0.	0.	[illegible]	0.	0.	0.4279E 15
31 AO 2	[illegible]	[illegible]	25.2300	[illegible]	6.3[illegible]	0.1[illegible]E [illegible]	0.[illegible]E 1[illegible]
31 AO 3	3725746.	276[illegible]1.	24.[illegible]	[illegible]	6.1[illegible]	0.[illegible]E [illegible]	0.[illegible]4E 1[illegible]
31 AO 4	3974[illegible]1.	253[illegible].	24.[illegible]	[illegible]	6.1[illegible]	0.[illegible]E 06	0.[illegible]E 15
31 AO 5	[illegible]99[illegible]4.	124643.	23.6671	[illegible]	[illegible]	[illegible]E 06	0.[illegible] 15
31 AO 6	[illegible]965[illegible].	132[illegible].	24.4[illegible]	899636.	6.1[illegible]	[illegible].1475E [illegible]	0.[illegible] 1[illegible]
31 AO 7	35[illegible].	[illegible].	[illegible].7[illegible]	[illegible]	5.[illegible]	[illegible].1[illegible]E 03	0.4202E 15
31 AO 8	3[illegible]64[illegible].	1[illegible].	[illegible].14[illegible]	[illegible]41.[illegible]	[illegible]	[illegible]E 0[illegible]	0.4[illegible]05E 15
31 AO 9	3638215.	19[illegible].3.	20.8400	[illegible]		[illegible].1[illegible]E 06	0.4[illegible]29[illegible] 15
32 AO 1	53.	0.	0.	[illegible]		0.	0.63172 10
32 AO 2	184.	0.	0.	46.		0.	0.21917 11
32 AO 3	114.	0.	0.	29.		0.	0.13625 11

SECRET

TABLE 3.4 MASS AND ACTIVITY DISTRIBUTIONS OF DEBRIS

SAMPLE NUMBER		SIZE (MICRONS)	MASS (GRAMS)	ACTIVITY AT 100 HR (MA)	CUMULATIVE DISTRIBUTION PERCENT LESS THAN MASS	CUMULATIVE DISTRIBUTION PERCENT LESS THAN ACTIVITY	SPECIFIC ACTIVITY (MA/GRAMS)
01 A0 2	T		22.8000	0.1304E-05			
01 A0 2		2830	1.8000	0.1616E-06	92.11	86.07	0.1009E-06
01 A0 2		1410	1.9000	0.4426E-06	83.77	52.13	0.2330E-06
01 A0 2		710	2.8000	0.3338E-06	71.49	26.37	0.1199E-06
01 A0 2		350	2.6000	0.1733E-06	60.09	12.93	0.6742E-07
01 A0 2		177	3.4000	0.7562E-07	45.16	7.13	0.2224E-07
01 A0 2		88	4.9000	0.4242E-07	23.68	3.67	0.8656E-08
01 A0 2		32	2.1000	0.1532E-07	14.47	2.66	0.7330E-08
01 A0 2		43	1.3000	0.1314E-07	7.46	1.68	0.[illegible]E-08
01 A0 2		PAN	1.7000	0.2105E-07	0.	0.	0.1[illegible]E-07
01 A0 3	T		36.8300	0.2578E-05			
01 A0 3		2830	4.7500	0.7859E-06	87.09	69.51	0.165[illegible]E-06
01 A0 3		1410	3.0300	0.3772E-06	73.80	35.49	0.2[illegible]E-06
01 A0 3		710	4.2500	0.3306E-06	67.26	21.88	0.8255E-07
01 A0 3		177	10.4300	0.3930E-06	38.99	6.64	0.3778E-07
01 A0 3		33	7.3500	0.9822E-07	19.02	2.83	0.1336E-07
01 A0 3		43	4.0000	0.3646E-07	8.15	1.41	0.9116E-08
01 A0 3		PAN	3.0000	0.3646E-07	0.	0.	0.1215E-07
01 A04-5	T		97.9600	0.4523E-05			
01 A04-5		2830W	21.7000	0.1623E-05	77.85	64.13	0.7472E-07
01 A04-5		1410W	8.9000	0.8701E-06	68.76	44.89	0.9776E-07
01 A04-5		710W	9.4000	0.5875E-06	59.17	[illegible].91	0.6250E-07
01 A04-5		350W	8.6000	0.3111E-06	50.39	25.03	0.3617E-07
01 A04-5		177W	12.5000	0.3156E-06	37.63	18.05	0.2525E-07
01 A04-5		124W	10.2000	0.3156E-06	27.22	11.08	0.3094E-07
01 A04-5		88W	8.9000	0.1402E-06	18.13	7.92	0.1576E-07
01 A04-5		62W	6.7000	0.1017E-06	11.29	5.73	0.1519E-07
01 A04-5		43W	4.7000	0.7837E-07	6.49	3.99	0.1668E-07
01 A04-5		30W	0.9400	0.2011E-07	5.53	3.55	0.2139E-07
01 A04-5		20W	0.5400	0.3473E-07	4.98	2.78	0.6431E-07
01 A04-5		10W	2.1600	0.4516E-07	2.78	1.78	0.2091E-07
01 A04-5		5W	0.7000	0.1969E-07	2.06	1.35	0.2813E-07
01 A04-5		3W	0.7800	0.2126E-07	1.27	0.88	0.2726E-07
01 A04-5		1W	0.7000	0.2109E-07	0.55	0.41	0.3012E-07
01 A04-5		-1W	0.5400	0.1861E-07	0.	0.	0.3445E-07

TABLE 3.4 MASS AND ACTIVITY DISTRIBUTIONS OF DEBRIS (CONTD)

SAMPLE NUMBER		SIZE (MICRONS)	MASS (GRAMS)	ACTIVITY AT 100 HR (MA)	CUMULATIVE DISTRIBUTION PERCENT LESS THAN MASS	CUMULATIVE DISTRIBUTION PERCENT LESS THAN ACTIVITY	SPECIFIC ACTIVITY (MA/GRAMS)
02 A01-5-2	T		64.0600	0.4158E-06			
02 A01-5-2		4750W	7.7900	0.1236E-07	87.99	97.03	0.1587E-08
02 A01-5-2		2830W	2.2000	0.8887E-07	84.60	75.65	0.4040E-07
02 A01-5-2		1410W	3.7200	0.7612E-07	78.86	57.35	0.2046E-07
02 A01-5-2		710W	4.9000	0.7003E-07	71.31	40.49	0.1430E-07
02 A04-5-3		350W	4.8100	0.3817E-07	63.89	31.80	0.7519E-08
02 A01-5-2		177W	3.0300	0.3393E-07	59.23	23.64	0.[illegible]E-08
02 A04-5-3		124W	7.7500	0.1957E-07	38.28	18.93	0.2525E-08
02 A01-6-2		88W	6.7000	0.1422E-07	27.95	15.51	0.2122E-08
02 A04-6-3		62W	5.3800	0.1151E-07	19.66	12.74	0.2140E-08
02 A04-5-3		43W	4.3100	0.9143E-08	13.01	10.54	0.2121E-08
02 A04-5-3		30W	0.8400	0.1477E-08	11.72	10.19	0.1758E-08
02 A01-5-2		20W	3.2000	0.6022E-08	6.78	8.74	0.1882E-08
02 A04-5-3		10W	1.7400	0.7548E-08	4.10	6.92	0.4338E-08
02 A01-6-2		5W	0.8200	0.2576E-07	2.84	0.73	0.3142E-07
02 A01-5-2		3W	1.0400	0.3031E-08	1.23	0.	0.2915E-08
02 A04-5-3		-1W	0.8000	0.	0.	0.	0.
12 A0789	T		19.1500	0.2513E-06			
12 A0789		2830W	1.1500	0.3439E-07	98.99	86.31	0.2991E-07
12 A0789		1410W	1.8500	0.1109E-06	84.33	42.18	0.5994E-07
12 A0789		710W	2.3500	0.3746E-07	72.06	27.28	0.1594E-07
12 A0789		350W	1.9500	0.3569E-07	61.88	13.07	0.1830E-07
12 A0789		177W	2.8800	0.1335E-07	46.84	7.76	0.4636E-08
12 A0789		124W	2.0000	0.4861E-08	36.40	5.83	0.2431E-08
12 A0789		88W	1.6500	0.3430E-08	27.78	4.44	0.2107E-08
12 A0789		62W	1.2800	0.2653E-08	21.10	3.39	0.2073E-08
12 A0789		43W	1.0800	0.2472E-08	15.46	2.40	0.2289E-08
12 A0789		30W	1.3000	0.1303E-10	8.67	2.40	0.1003E-10
12 A0789		10W	0.4000	0.6022E-08	3.58	0.	0.1506E-07
12 A0789		5W	0.4200	0.	4.39	0.	0.
12 A0789		3W	0.3400	0.	2.61	0.	0.
12 A0789		1W	0.3800	0.	0.63	0.	0.
12 A0789		-1W	0.1200	0.	0.	0.	0.
20 A0 4	T		5.3800	0.8852E-06			
20 A0 4		2830	0.5000	0.5454E-06	90.71	6.80	0.1091E-05
20 A0 4		1410	0.2500	0.4934E-08	86.06	5.96	0.1974E-07
20 A0 4		710	0.2000	0.1199E-07	82.34	3.91	0.5994E-07
20 A0 4		350	0.1300	0.7788E-08	79.93	2.58	0.5991E-07
20 A0 4		177	0.2000	0.6165E-08	76.21	1.53	0.3082E-07
20 A0 4		88	0.6800	0.4478E-08	63.57	0.76	0.6585E-08
20 A0 4		43	1.9200	0.2792E-08	27.88	0.26	0.1454E-08
20 A0 4		PAN	1.5000	0.1637E-08	0.	0.	0.1102E-08

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TABLE 3.4 MASS AND ACTIVITY DISTRIBUTIONS OF SAMPLES (CONTD)

SAMPLE NUMBER		SIZE (MICRONS)	MASS (GRAMS)	ACTIVITY AT 100 HR (MA)	CUMULATIVE DISTRIBUTION PERCENT LESS THAN MASS	CUMULATIVE DISTRIBUTION PERCENT LESS THAN ACTIVITY	SPECIFIC ACTIVITY (MA/GRAMS)
20 AO 7	T		13.2200	0.4374E-06			
20 AO 7		2830	2.0200	0.1602E-06	74.37	66.09	0.6237E-07
20 AO 7		1410	1.0700	0.[illegible]E-07	[illegible]	56.60	0.1302E-07
20 AO 7		710	1.3600	0.5731E-07	[illegible]	42.66	0.4032E-07
20 AO 7		350	1.7100	0.4039E-07	55.10	34.30	0.2362E-07
20 AO 7		177	1.7000	0.5057E-07	45.07	22.97	0.3253E-07
20 AO 7		88	1.6900	0.4938E-07	35.10	12.84	0.2922E-07
20 AO 7		43	2.3200	0.3237E-07	18.47	6.20	0.1142E-07
20 AO 7		PAN	3.1000	0.3021E-07	0.	0.	0.9632E-08
21 AO 1	T		0.	0.1334E-05			
21 AO 1		2830	-0.	0.1702E-05	0.	65.52	0.
21 AO 1		1410	-0.	0.4472E-06	0.	52.01	0.
21 AO 1		710	-0.	0.3409E-06	0.	25.45	0.
21 AO 1		350	-0.	0.1792E-06	0.	13.02	0.
21 AO 1		177	-0.	0.7017E-07	0.	7.16	0.
21 AO 1		88	-0.	0.4412E-07	0.	3.86	0.
21 AO 1		62	-0.	0.1604E-07	0.	2.66	0.
21 AO 1		43	-0.	0.1344E-07	0.	1.60	0.
21 AO 1		PAN	-0.	0.2198E-07	0.	0.	0.
30 A02-8	T		7.4100	0.5405E-06			
30 A02-8		2830W	0.0300	0.7475E-07	94.87	86.24	0.1767E-04
30 A02-8		1410W	0.1300	0.1327E-06	92.44	56.05	0.2495E-05
30 A02-8		710W	0.0900	0.1354E-06	91.23	40.34	0.1804E-05
30 A02-8		350W	0.0200	0.5191E-07	70.15	18.07	0.6483E-06
30 A02-8		177W	0.3300	0.4495E-07	85.70	6.79	0.1424E-05
30 A02-8		124W	0.6300	0.1665E-07	76.92	5.50	0.2363E-07
30 A02-8		88W	0.7700	0.7021E-08	63.56	3.76	0.2912E-08
30 A02-8		62W	1.3700	0.3924E-08	45.07	2.57	0.4324E-08
30 A02-8		43W	1.3000	0.4529E-08	23.48	1.70	0.2030E-08
30 A02-8		30W	1.1300	0.2141E-08	7.56	1.28	0.1615E-08
30 A02-8		-1W	0.3300	0.6433E-08	0.	0.	0.1154E-07
31 AO 5	T		23.0671	0.4030E-04			
31 AO 5		2830	0.0420	0.2718E-08	99.82	99.99	0.6373E-07
31 AO 5		1410	1.0505	0.1899E-05	95.42	95.28	0.1808E-05
31 AO 5		710	10.3673	0.2037E-04	49.47	44.24	0.1076E-03
31 AO 5		350	9.0223	0.1593E-04	10.41	4.72	0.1709E-03
31 AO 5		177	0.6179	0.1019E-04	7.82	2.19	0.1649E-05
31 AO 5		88	0.7370	0.5119E-06	4.73	0.92	0.6945E-06
31 AO 5		43	0.1424	0.2438E-06	4.11	0.31	0.1356E-05
31 AO 5		PAN	0.9311	0.1242E-06	0.	0.	0.1266E-06

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TABLE 3.4 MASS AND ACTIVITY DISTRIBUTIONS OF DEBRIS (CONTD)

SAMPLE NUMBER		SIZE (MICRONS)	MASS (GRAMS)	ACTIVITY AT 100 HR (MA)	CUMULATIVE DISTRIBUTION PERCENT LESS THAN MASS	ACTIVITY	SPECIFIC ACTIVITY (MA/GRAMS)
31 AO 8	T		24.9359	0.4019E-04			
31 AO 8		2830	0.0318	0.5300E-08	99.87	99.99	0.1667E-06
31 AO 8		1410	1.4278	0.2581E-05	94.15	93.64	0.1787E-05
31 AO 8		710	11.6259	0.2114E-04	47.52	41.06	0.1818E-05
31 AO 8		350	9.1250	0.1496E-04	10.93	3.84	0.1639E-05
31 AO 8		177	0.6132	0.9156E-06	8.47	1.56	0.1493E-05
31 AO 8		88	0.7079	0.2604E-06	5.63	0.92	0.3678E-06
31 AO 8		43	0.8365	0.1521E-06	2.20	0.54	0.1775E-06
31 AO 8		PAN	0.5470	0.2166E-06	0.	0.	0.3955E-06
31 AO5-8	T		47.1787	0.6923E-04			
31 AO5-8		2830W	0.0620	0.	99.87	100.00	0.
31 AO5-8		1410W	2.2153	0.3674E-05	95.17	94.69	0.1658E-05
31 AO5-8		710W	21.5518	0.4266E-04	49.49	33.0[illegible]	0.1979E-05
31 AO5-8		350W	18.7045	0.1969E-04	9.85	4.63	0.1053E-05
31 AO5-8		177W	1.2252	0.1984E-05	7.25	1.77	0.1620E-05
31 AO5-8		88W	1.3953	0.5729E-06	4.29	0.94	0.4103E-06
31 AO5-8		43W	1.4441	0.3530E-06	1.23	0.43	0.2445E-06
31 AO5-8		30W	0.1000	0.1691E-07	1.02	0.40	0.1691E-06
31 AO5-8		20W	0.1500	0.2339E-07	0.66	0.37	0.1567E-06
31 AO5-8		10W	0.1200	0.5927E-07	0.42	0.28	0.4939E-06
31 AO5-8		5W	0.0800	0.1692E-07	0.25	0.26	0.2116E-06
31 AO5-8		3W	0.0400	0.4233E-07	0.17	0.20	0.1058E-05
31 AO5-8		1W	0.	0.2540E-07	0.17	0.16	0.0000E-[illegible]
31 AO5-8		-1W	0.0800	0.1101E-06	0.	0.	0.1376E-05

TABLE 3.5 GAMMA DECAY RATES BY SCINTILLATION COUNTER

SAMPLE NUMBER	AGE (DAYS)	OBSERVED ACTIVITY (C/M)	ACTIVITY AT 100 HR (C/M)
1 AO 1	0.4740	4281139.	557681.
1 AO 1	1.0290	2595033.	678529.
1 AO 1	2.1640	1639000.	679948.
1 AO 1	3.0340	[illegible]	572877.
1 AO 1	4.0250	731032.	683569.
1 AO 1	7.3320	317347.	644175.
1 AO 1	8.3560	265796.	638444.
1 AO 1	8.6400	271177.	676927.
1 AO 1	9.2150	242502.	657885.
1 AO 1	10.0180	221264.	654885.
1 AO 1	12.0820	[illegible]	674357.
1 AO 1	13.2630	152630.	647728.
1 AO 1	14.0460	127755.	561533.
1 AO 1	15.1770	127785.	600910.
1 AO 1	[illegible]	42008.	713601.
1 AO 1	[illegible]	24467.	858222.
1 AO 1	17.0000	13425.	727455.
2 AO 7	0.3960	183206.	9015.
2 AO 7	1.0450	21317.	[illegible]
2 AO 7	2.1630	[illegible]	2569.
2 AO 7	3.0370	[illegible]	2016.
2 AO 7	4.0210	4939.	3512.
2 AO 7	7.3290	2456.	[illegible]
12 AO 4	0.4000	58158.	2895.
12 AO 4	1.0360	12561.	2322.
12 AO 4	2.1590	6166.	[illegible]
12 AO 4	3.0420	4009.	1611.
12 AO 4	4.0240	4427.	[illegible]
12 AO 4	7.3260	2445.	3023.
30 AO 1	[illegible]	15913.	772.
30 AO 1	1.0400	7496.	1322.
30 AO 1	2.1370	[illegible]	1270.
30 AO 1	3.0410	2816.	1048.
30 AO 1	[illegible]	[illegible]	2567.
30 AO 1	7.3340	[illegible]	[illegible]
31 AO 1	7.5350	[illegible]	3595917.
31 AO 1	8.3700	[illegible]	3520585.
31 AO 1	[illegible]	1246233.	3724190.
31 AO 1	9.2050	[illegible]	[illegible]
31 AO 1	10.0210	[illegible]	[illegible]
31 AO 1	12.0630	[illegible]	[illegible]
31 AO 1	13.2650	[illegible]	3120330.
31 AO 1	14.0490	626992.	2772550.
31 AO 1	[illegible]	[illegible]	[illegible]
31 AO 1	[illegible]	[illegible]	[illegible]
31 AO 1	[illegible]	[illegible]	[illegible]
31 AO 1	[illegible]	[illegible]	2916221.
31 AO 1	[illegible]	[illegible]	[illegible]
31 AO 1	[illegible]	[illegible]	[illegible]
31 AO 1	[illegible]	43745.	[illegible]

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TABLE 3.6 GAMMA DECAY RATES BY 4 PI IONIZATION CHAMBER

SAMPLE NUMBER			SIZE (MICRONS)	AGE (DAYS)	OBSERVED ACTIVITY (MA)	ACTIVITY AT 100 HR (MA)
01	AO	2	2830	0.5410	0.3400E-05	0.2368E-06
01	AO	2	2830	1.0930	0.1370E-05	0.2325E-06
01	AO	2	2830	1.9380	0.8750E-06	0.2181E-06
01	AO	2	2830	2.4990	0.5680E-06	0.1824E-06
01	AO	2	2830	4.0520	0.2300E-06	0.1616E-06
01	AO	2	2830	4.2500	0.2100E-06	0.1816E-06
01	AO	2	2830	4.9310	0.1600E-06	0.1870E-06
01	AO	2	2830	5.4710	0.1500E-06	0.2006E-06
01	AO	2	2830	5.9610	0.1300E-06	0.1942E-06
01	AO	2	2830	7.9630	0.9320E-07	0.1968E-06
01	AO	2	2830	11.9240	0.6150E-07	0.1907E-06
	AO	2	2830	13.9410	0.5250E-07	0.1906E-06
01	AO	2	2830	17.0090	0.4230E-07	0.1903E-06
01	AO	2	2830	26.9730	0.3100E-07	0.1843E-06
01	AO	2	2830	29.9750	0.2850E-07	0.1862E-06
01	AO	2	2830	34.0130	0.2600E-07	0.1862E-06
01	AO	2	2830	37.0070	0.2460E-07	0.1906E-06
01	AO	2	2830	40.9830	0.2280E-07	0.1892E-06
01	AO	2	2830	43.9700	0.2100E-07	0.1870E-06
01	AO	2	2830	51.0530	0.1800E-07	0.1802E-06
01	AO	2	2830	57.1330	0.1600E-07	0.1758E-06
01	AO	2	2830	71.0520	0.1400E-07	0.1781E-06
01	AO	2	2830	79.0120	0.1300E-07	0.1585E-06
01	AO	2	2830	93.1390	0.1150E-07	0.1663E-06
01	AO	2	2830	101.1560	0.1020E-07	0.1679E-06
01	AO	2	2830	143.0800	0.7100E-08	0.1680E-06
01	AO	2	2830	221.7030	0.3330E-08	0.1549E-06
01	AO	2	1410	0.5410	0.6700E-05	0.4666E-06
01	AO	2	1410	1.0930	0.2700E-05	0.4577E-06
01	AO	2	1410	1.9380	0.1050E-05	0.4613E-06
01	AO	2	1410	2.4990	0.1250E-05	0.4015E-06
01	AO	2	1410	4.0520	0.5600E-06	0.4426E-06
01	AO	2	1410	4.2500	0.5120E-06	0.4433E-06
01	AO	2	1410	4.9320	0.4000E-06	0.4597E-06
01	AO	2	1410	5.4710	0.3550E-06	0.4753E-06
01	AO	2	1410	5.9610	0.3150E-06	0.4715E-06
01	AO	2	1410	7.9630	0.2230E-06	0.4720E-06
01	AO	2	1410	11.9270	0.1550E-06	0.4626E-06
01	AO	2	1410	13.9410	0.1400E-06	0.5110E-06
01	AO	2	1410	17.0390	0.1120E-06	0.5068E-06
01	AO	2	1410	19.9560	1.0000E-07	0.4945E-06
01	AO	2	1410	26.9920	0.8500E-07	0.5097E-06
01	AO	2	1410	29.9760	0.7900E-07	0.5210E-06
01	AO	2	1410	34.0130	0.7200E-07	0.5207E-06
01	AO	2	1410	37.0030	0.6820E-07	0.5291E-06
01	AO	2	1410	40.9830	0.6400E-07	0.5371E-06
01	AO	2	1410	43.9710	0.5950E-07	0.5364E-06
01	AO	2	1410	51.0520	0.5250E-07	0.5315E-06
01	AO	2	1410	57.1340	0.4800E-07	0.5364E-06
01	AO	2	1410	71.0520	0.4150E-07	0.5363E-06
01	AO	2	1410	79.0120	0.3900E-07	[illegible]
01	AO	2	1410	[illegible]	0.3540E-07	0.5211E-06
01	AO	2	1410	101.1560	0.3100E-07	0.5241E-06
01	AO	2	1410	143.0800	0.2100E-07	0.5158E-06
01	AO	2	1410	221.7030	0.1100E-07	0.5212E-06
01	AO	2	710	0.5410	0.3000E-05	0.3723E-06
01	AO	2	710	1.0930	0.2130E-05	0.3200E-06
01	AO	2	710	1.9380	0.1430E-05	0.3310E-06
01	AO	2	710	2.4990	0.9910E-06	0.3183E-06
01	AO	2	710	4.0520	0.4250E-06	0.3358E-06
01	AO	2	710	4.2500	[illegible]	0.3356E-06
01	AO	2	710	4.9530	0.3730E-06	0.3482E-06
01	AO	2	710	5.471	0.2700E-06	0.3615E-06

TABLE 3.6 GAMMA DECAY RATES BY 4 PI IONIZATION CHAMBER (CONTD)

SAMPLE NUMBER	SIZE (MICTONS)	AGE (DAYS)	OBSERVED ACTIVITY (MA)	ACTIVITY AT 100 HR (MA)
01 AO 2	710	5.7620	0.2400E-06	0.3592E-06
01 AO 2	710	7.9630	0.1620E-06	0.3426E-06
1 AO 2	710	11.7270	0.1180E-06	0.3671E-06
01 AO 2	[illegible]	13.9410	0.1050E-06	0.3830E-06
01 AO 2	710	[illegible]	0.8370E-07	0.3785E-06
01 AO 2	710	17.9360	0.7700E-07	[illegible]E-06
01 AO 2	710	20.7920	0.6400E-07	[illegible]E-06
01 AO 2	710	27.9770	0.6[illegible]E-07	0.3950E-06
01 AO 2	710	34.0140	0.5500E-07	0.3971E-06
01 AO 2	710	37.0030	0.5100E-07	0.3792E-06
01 AO 2	710	[illegible]	0.4800E-07	0.4020E-06
01 AO 2	710	43.7720	0.4500E-07	0.4043E-06
01 AO 2	710	51.0520	0.4000E-07	0.4042E-06
01 AO 2	710	57.1330	0.3620E-07	0.4034E-06
01 AO 2	710	71.0330	0.3120E-07	0.4034E-06
01 AO 2	710	79.0130	0.2900E-07	0.3593E-06
01 AO 2	710	83.1610	0.2680E-07	0.3934E-06
01 AO 2	710	101.1560	0.2350E-07	0.4008E-06
01 AO 2	710	143.0500	0.1600E-07	0.3999E-06
01 AO 2	710	221.9080	0.3100E-08	0.3786E-06
01 AO 2	350	0.3410	0.2700E-05	0.2020E-06
01 AO 2	350	1.0930	0.1600E-05	0.1979E-06
01 AO 2	350	1.9330	0.7300E-06	0.1944E-06
01 AO 2	350	2.5000	0.5190E-06	0.1[illegible]7E-06
01 AO 2	350	4.0520	0.2290E-06	0.1753E-06
01 AO 2	350	4.2310	0.2030E-06	0.1774E-06
01 AO 2	350	4.9140	0.1530E-06	0.1814E-06
01 AO 2	350	5.4710	0.1400E-06	0.1872E-06
01 AO 2	350	5.9630	0.1280E-06	0.1913E-06
01 AO 2	350	7.9690	0.9100E-07	0.1921E-06
01 AO 2	350	11.7270	0.6150E-07	0.1907E-06
01 AO 2	350	13.9410	0.5350E-07	0.1953E-06
01 AO 2	350	18.0410	0.4350E-07	0.1971E-06
01 AO 2	350	19.7320	0.4100E-07	0.2016E-06
01 AO 2	350	26.9930	0.3400E-07	0.2024E-06
01 AO 2	350	27.9730	0.3120E-07	0.2042E-06
01 AO 2	350	34.0150	0.2900E-07	0.2030E-06
01 AO 2	350	37.0090	0.2750E-07	0.2117E-06
01 AO 2	350	40.9740	0.2500E-07	0.2162E-06
01 AO 2	350	43.9720	0.2400E-07	0.2142E-06
01 AO 2	350	51.0300	0.2100E-07	0.2107E-06
01 AO 2	350	57.1330	0.2350E-07	0.3279E-06
01 AO 2	350	71.0740	0.1550E-07	0.2148E-06
1 AO 2	350	79.0130	0.1300E-07	0.1963E-06
01 AO 2	350	83.1320	0.1430E-07	0.2108E-06
01 AO 2	[illegible]	101.1560	0.1300E-07	0.2158E-06
01 AO 2	350	143.0600	0.8500E-08	0.2036E-06
01 AO 2	350	221.9120	0.4350E-08	0.1942E-06
01 AO 2	177	[illegible]	0.1[illegible]E-05	0.[illegible]E-07
01 AO 2	177	1.0330	0.7100E-06	0.8779E-07
01 AO 2	177	1.7300	0.3450E-06	0.8395E-07
01 AO 2	177	2.0000	0.2260E-06	0.7452E-07
01 AO 2	177	[illegible]	0.[illegible]600E-07	0.7562E-07
01 AO 2	177	4.0210	0.1100E-07	0.7593E-07
01 AO 2	177	4.9330	0.6100E-07	0.7440E-07
01 AO 2	177	5.4720	0.6020E-07	0.8021E-07
01 AO 2	177	5.9530	0.5330E-07	0.7931E-07
01 AO 2	177	7.9640	0.3300E-07	0.7974E-07
01 AO 2	177	11.7330	0.2500E-07	0.7.91E-07
01 AO 2	177	13.9420	0.2200E-07	0.8064E-07
01 AO 2	177	18.0420	0.1500E-07	0.8403E-07
01 AO 2	177	[illegible]	0.1720E-07	0.8342E-07
01 AO 2	177	27.0040	0.1300E-07	0.8808E-07

TABLE 3.6 GAMMA DECAY RATES BY 4-PI IONIZATION CHAMBER (CONTD).

SAMPLE NUMBER	SIZE (MICRONS)	AGE (DAYS)	OBSERVED ACTIVITY (MA)	ACTIVITY AT 100 HR (MA)
01 A0 2	177	29.978[illegible]	0.1030E-07	0.[illegible]2E-07
01 A0 2	177	34.0150	0.1200E-07	0.9164E-07
01 A0 2	177	37.0100	0.1220E-07	0.9219E-07
01 A0 2	177	40.[illegible]	0.1120E-07	0.9121E-07
01 A0 2	177	43.9700	0.1100E-07	0.[illegible]E-07
01 A0 2	177	51.0450	0.7600E-08	0.9460E-07
01 A0 2	177	57.1370	0.8600E-08	0.9240E-07
01 A0 2	177	71.0350	0.7350E-08	0.9143E-07
01 A0 2	177	79.0160	0.6900E-08	0.8173E-07
01 A0 2	177	[illegible].1640	0.6450E-08	0.9130E-07
01 A0 2	177	101.1560	0.5750E-08	0.9164E-07
01 A0 2	177	142.0000	0.3900E-08	0.8868E-07
01 A0 2	177	221.9120	0.2400E-08	0.9[illegible]E-07
01 A0 2	88	0.5410	0.7950E-06	0.5530E-07
01 A0 2	88	1.0930	0.4100E-06	0.5067E-07
01 A0 2	88	1.9[illegible]	0.[illegible]930E-06	0.4[illegible]04E-07
01 A0 2	88	2.5000	0.1300E-06	0.4166E-07
01 A0 2	88	4.0330	0.5400E-07	0.4242E-07
01 A0 2	88	4.2510	0.4980E-07	0.4282E-07
01 A0 2	88	4.9550	0.3850E-07	0.4386E-07
01 A0 2	88	5.4720	0.3450E-07	0.4574E-07
01 A0 2	88	5.9640	0.3050E-07	0.4514E-07
01 A0 2	88	7.9640	0.2180E-07	0.4538E-07
01 A0 2	88	11.9290	0.1500E-07	0.4558E-07
01 A0 2	88	13.9420	0.1330E-07	0.4692E-07
01 A0 2	88	18.0420	0.1080E-07	0.4724E-07
01 A0 2	88	19.9580	1.0000E-08	0.4787E-07
01 A0 2	88	27.0350	0.8300E-08	0.4766E-07
01 A0 2	88	29.9800	0.7900E-08	0.4972E-07
01 A0 2	88	34.0180	0.7300E-08	0.5019E-07
01 A0 2	88	37.0130	0.6800E-08	0.5000E-07
01 A0 2	88	40.9880	0.6350E-08	0.5025E-07
01 A0 2	88	43.9750	0.6100E-08	0.5173E-07
01 A0 2	88	51.0440	0.5300E-08	0.5090E-07
01 A0 2	88	57.1380	0.4920E-08	0.5093E-07
01 A0 2	88	71.0560	0.4000E-08	0.4715E-07
01 A0 2	88	79.0180	0.3950E-08	0.4467E-07
01 A0 2	88	83.1650	0.2700E-08	0.5048E-07
01 A0 2	88	101.1560	0.2300E-08	0.[illegible]10E-07
01 A0 2	88	142.0000	0.2300E-08	0.4871E-07
01 A0 2	88	221.9140	0.205[illegible]E-08	0.[illegible]112E-07
01 A0 2	62	0.5410	0.2900E-06	0.2017E-07
01 A0 2	62	1.0730	0.1500E-06	0.1851E-07
01 A0 2	62	1.9300	0.7100E-07	0.1761E-07
01 A0 2	62	2.5010	0.4690E-07	0.1496E-07
01 A0 2	62	4.0340	0.2000E-07	0.1[illegible]E-07
01 A0 2	62	4.2520	0.1900E-07	0.1613E-07
01 A0 2	62	4.[illegible]	0.1430E-07	0.1623E-07
01 A0 2	62	5.4720	0.1070E-07	0.1757E-07
01 A0 2	62	5.9640	0.1200E-07	0.1740E-07
01 A0 2	62	7.9350	0.8500E-08	0.1717E-07
01 A0 2	62	11.[illegible]	0.6150E-08	0.17[illegible]E-07
01 A0 2	62	13.9[illegible]	0.5500E-08	0.1[illegible]E-07
01 A0 2	62	18.0430	0.4420E-08	0.1[illegible]E-07
01 A0 2	62	1[illegible]	0.4000E-08	0.17[illegible]E-07
[illegible] A0 2	62	[illegible]	[illegible]	[illegible]
01 A0 2	62	2[illegible]00	0.[illegible]00E-08	0.1[illegible]E-07

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TABLE 3.6 GAMMA DECAY RATES BY 4 PI IONIZATION CHAMBER (CONTD)

SAMPLE NUMBER	SIZE (MICRONS)	TSD (DAYS)	OBSERVED ACTIVITY (MA)	ACTIVITY AT 100 HR (MA)
01 AO 2	62	34.0210	0.2200E-08	0.1955E-07
01 AO 2	62	37.0130	0.2730E-08	0.1836E-07
01 AO 2	62	40.9910	0.2600E-08	0.1858E-07
01 AO 2	62	43.9770	0.2630E-08	0.2042E-07
01 AO 2	62	51.0410	0.2130E-08	0.1363E-07
01 AO 2	62	57.1330	0.2200E-08	0.2028E-07
01 AO 2	62	71.0370	0.1150E-08	0.2030E-07
01 AO 2	62	79.0190	0.1300E-08	0.1761E-07
01 AO 2	62	85.1670	0.1000E-08	0.1656E-07
01 AO 2	62	101.1560	0.1000E-08	0.1[illegible]E-07
01 AO 2	62	143.0800	1.0000E-09	0.1624E-07
01 AO 2	62	[illegible]1.0110	0.1010E-08	0.3190E-07
01 AO 2	43	0.5410	0.2200E-05	0.16[illegible]E-07
01 AO 2	43	1.0930	0.1230E-06	0.1517E-07
01 AO 2	43	1.9410	0.5800E-07	0.1440E-07
01 AO 2	43	2.50[illegible]	0.3880E-07	0.1235E-07
01 AO 2	43	4.0340	0.1700E-07	0.1314E-07
01 AO 2	43	4.2520	0.1600E-07	0.1353E-07
01 AO 2	43	4.9560	0.1240E-07	0.1362E-07
01 AO 2	43	5.4750	0.1150E-07	0.1490E-07
01 AO 2	43	5.9640	0.1020E-07	0.1470E-07
01 AO 2	43	7.9670	0.7620E-08	0.1532E-07
01 AO 2	43	11.9300	0.5350E-08	0.1545E-07
01 AO 2	43	13.9440	0.4700E-08	0.1540E-07
01 AO 2	43	16.0450	0.3630E-08	0.1473E-07
01 AO 2	43	1[illegible].[illegible]310	0.3450E-08	0.1515E-07
01 AO 2	43	27.0330	0.2900E-08	0.1508E-07
01 AO 2	43	29.9810	0.2520E-08	0.1511E-07
01 AO 2	43	34.0220	0.2300E-08	0.1523E-07
01 AO 2	43	37.0170	0.2330E-08	0.1524E-07
01 AO 2	43	40.9930	0.2200E-08	0.1520E-07
01 AO 2	43	43.9710	0.2230E-08	0.1679E-07
01 AO 2	43	51.0410	0.1800E-08	0.1527E-07
01 AO 2	43	57.1330	0.1700E-08	0.1463E-07
01 AO 2	43	71.0390	0.1500E-08	0.1441E-07
01 AO 2	43	79.0190	0.1[illegible]E-08	0.1233E-07
01 AO 2	43	85.1630	0.1300E-08	0.1462E-07
01 AO 2	43	101.1560	0.1330E-08	0.1627E-07
01 AO 2	43	143.0200	0.7000E-09	0.1374E-07
01 AO 2	43	221.7130	0.7700E-09	0.2212E-07
01 AO 2	PAN	0.5410	0.3850E-06	0.2679E-07
01 AO 2	PAN	1.0930	0.2000E-06	0.2431E-07
01 AO 2	PAN	1.9410	0.9320E-07	0.2370E-07
01 AO 2	PAN	2.5020	0.6310E-07	0.2019E-07
01 AO 2	PAN	4.0330	0.3000E-07	0.2183E-07
01 AO 2	PAN	4.2520	0.2600E-07	0.2220E-07
01 AO 2	PAN	4.9760	0.2030E-07	0.2343E-07
01 AO 2	PAN	5.4730	0.1900E-07	0.2497E-07
01 AO 2	PAN	5.9650	0.1700E-07	0.2490E-07
01 AO 2	PAN	7.9670	0.1200E-07	0.2461E-07
01 AO 2	PAN	11.9310	0.9000E-08	0.2271E-07
01 AO 2	PAN	13.9430	0.7200E-08	0.2450E-07
01 AO 2	PAN	16.0470	0.5800E-08	0.2453E-07
01 AO 2	PAN	19.9610	0.5100E-08	0.2334E-07
01 AO 2	PAN	27.0410	0.4200E-08	0.2443E-07
01 AO 2	PAN	29.9820	0.3350E-08	0.2237E-07

SECRET

TABLE 3.6 GAMMA DECAY RATES BY 4 PI IONIZATION CHAMBER (CONTD)

SAMPLE NUMBER	SIZE (MICRONS)	AGE (DAYS)	OBSERVED ACTIVITY (MA)	ACTIVITY AT 100 HR (MA)
01 AO 2	PAN	34.0230	0.3700E-08	0.2401E-07
01 AO 2	PAN	37.0190	0.3350E-03	0.2305E-07
01 AO 2	PAN	40.9950	0.3200E-08	0.2365E-07
01 AO 2	PAN	51.0390	0.2630E-08	0.2372E-07
01 AO 2	PAN	57.1420	0.2300E-03	0.2141E-07
01 AO 2	PAN	71.0630	0.1930E-08	0.1965E-07
01 AO 2	PAN	79.0210	0.1900E-08	0.1887E-07
01 AO 2	PAN	83.1700	0.1800E-08	0.2227E-07
01 AO 2	PAN	101.1560	0.1700E-08	0.2227E-07
01 AO 2	PAN	143.0200	0.1100E-08	0.1873E-07
01 AO 2	PAN	221.9160	0.8000E-09	0.1767E-07
31 AO 4A		10.2690	0.1420E-04	0.3908E-04
31 AO 4A		11.0290	0.1160E-04	0.3321E-04
31 AO 4A		13.9620	0.9700E-05	0.3561E-04
31 AO 4A		18.0380	0.7780E-05	0.3533E-04
31 AO 4A		19.9510	0.7150E-05	0.3549E-04
31 AO 4A		26.9860	0.5700E-05	0.3433E-04
31 AO 4A		29.9710	0.5100E-05	0.3380E-04
31 AO 4A		34.0270	0.4600E-05	0.3346E-04
31 AO 4A		37.0210	0.4250E-05	0.3321E-04
31 AO 4A		40.9960	0.3850E-05	0.3252E-04
31 AO 4A		43.9010	0.3500E-05	0.3177E-04
31 AO 4A		51.0750	0.3000E-05	0.3055E-04
31 AO 4A		57.12[illegible]0	0.2650E-05	0.2985E-04
31 AO 4A		71.0490	0.2200E-05	0.2881E-04
31 AO 4A		79.0030	0.2000E-05	0.2516E-04
31 AO 4A		83.1510	0.1800E-05	0.2672E-04
31 AO 4A		101.1560	0.1580E-05	0.2706E-04
31 AO 4A		143.0300	0.1050E-05	0.2622E-04
31 AO 4A		221.9[illegible]00	0.5150E-06	0.2530E-04
31 AO 4B		10.2690	0.3690E-06	0.1565E-05
31 AO 4B		11.9330	0.4900E-06	0.1530E-05
31 AO 4B		13.9630	0.4200E-06	0.1540E-05
31 AO 4B		1[illegible].0340	0.3270E-06	0.1483E-05
31 AO 4B		19.9480	0.2900E-06	0.1437E-05
31 AO 4B		2[illegible].9010	0.2230E-06	0.1371E-05
31 AO 4B		2[illegible].9720	0.2050E-05	0.1356E-05
31 AO 4B		[illegible]4.0280	0.1900E-06	0.1379E-05
31 AO 4B		37.0210	0.1720E-06	0.1341E-05
31 AO 4B		40.9970	0.1600E-06	0.1348E-05
31 AO 4B		51.0760	0.1170E-06	0.1189E-05
31 AO 4B		57.1260	0.1080E-06	0.1212E-05
31 AO 4B		71.0470	0.8[illegible]00E-07	0.1115E-05
31 AO 4B		79.0030	0.7750E-07	0.9499E-06
31 AO 4B		83.1520	0.7000E-07	0.1035E-05
31 AO 4B		101.1550	0.6100E-07	0.1038E-05
31 AO 4B		143.0300	0.3900E-07	0.9654E-06
31 AO 4B		221.9200	0.1980E-07	0.9532E-06

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TABLE 3.7 DECAY MEASUREMENTS FOR CLOUD SAMPLE 837-L TAKEN AT 13,500-FOOT ALTITUDE AT H+34 MINUTES

All readings (ma) made in 4-pi ionization chamber

Age	Reading	Age	Reading
days	ma	days	ma
0.281	401×10^{-8}	19.964	339×10^{-10}
1.941	447×10^{-9}	27.042	222×10^{-10}
2.502	338×10^{-9}	29.983	189×10^{-10}
2.971	286×10^{-9}	34.027	157×10^{-10}
4.055	210×10^{-9}	37.020	139×10^{-10}
4.253	200×10^{-9}	40.982	114×10^{-10}
4.957	171×10^{-9}	43.969	970×10^{-11}
5.475	163×10^{-9}	51.030	710×10^{-11}
5.965	145×10^{-9}	57.142	568×10^{-11}
7.967	108×10^{-9}	71.061	318×10^{-11}
11.931	682×10^{-10}	79.022	292×10^{-11}
13.946	510×10^{-10}	83.173	226×10^{-11}
18.048	390×10^{-10}		

TABLE 3.8 DECAY MEASUREMENTS FOR SELECTED CHARACTERISTIC GRAY, FUSED, SINTERED AND WHITE FALLOUT PARTICLES FROM COLLECTOR 21A01

All readings (ma) made in 4-pi ionization chamber.

Age	Gray	Fused	Sintered	White
days	ma	ma	ma	ma
2.098	225×10^{-9}	459×10^{-9}	485×10^{-9}	414×10^{-10}
2.498	183×10^{-9}	352×10^{-9}	375×10^{-9}	283×10^{-10}
2.963	144×10^{-9}	265×10^{-9}	277×10^{-9}	189×10^{-10}
4.049	944×10^{-10}	165×10^{-9}	165×10^{-9}	802×10^{-11}
4.240	858×10^{-10}	152×10^{-9}	150×10^{-9}	740×10^{-11}
4.960	726×10^{-10}	122×10^{-9}	118×10^{-9}	495×10^{-11}
5.478	661×10^{-10}		111×10^{-9}	
5.596		113×10^{-9}		405×10^{-11}
5.957	594×10^{-10}	100×10^{-9}	100×10^{-9}	347×10^{-11}
7.959	440×10^{-10}	736×10^{-10}	678×10^{-10}	209×10^{-11}
11.936	285×10^{-10}	501×10^{-10}	498×10^{-10}	180×10^{-11}
13.961	238×10^{-10}	422×10^{-10}	430×10^{-10}	142×10^{-11}

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TABLE 3.9 DECAY MEASUREMENTS FOR GROSS SAMPLES AND SELECTED CHARACTERISTIC GRAY, FUSED, SINTERED AND WHITE FALLOUT PARTICLES FROM COLLECTOR 31A04

Sample weights were: 23.5for total sample; 22.5g for 31A04(A); 1.0g for 31A04(B).
All readings (ma) were made in 4-pi ionization chamber.

Age	31A04(A)	31A04(B)	Gray		Fused		Sintered	
			Age	Reading	Age	Reading	Age	Reading
days	ma	ma	days	ma	days	ma	days	ma
10.269	119×10^{-7}	476×10^{-9}	18.035	177×10^{-10}	18.036	329×10^{-10}	18.035	341×10^{-10}
11.938	970×10^{-8}	410×10^{-9}	19.950	164×10^{-10}	19.951	302×10^{-10}	19.950	318×10^{-10}
13.962	811×10^{-8}	351×10^{-9}	26.984	114×10^{-10}	29.974	206×10^{-10}	26.983	247×10^{-10}
18.038	650×10^{-8}	273×10^{-9}	29.973	105×10^{-10}	34.031	185×10^{-10}	29.977	222×10^{-10}
19.951	598×10^{-8}	242×10^{-9}	34.029	886×10^{-11}	37.023	172×10^{-10}	34.028	201×10^{-10}
26.986	476×10^{-8}	191×10^{-9}	37.022	819×10^{-11}	41.002	155×10^{-10}	37.022	189×10^{-10}
29.971	426×10^{-8}	171×10^{-9}	41.001	723×10^{-11}	43.985	139×10^{-10}	40.977	172×10^{-10}
34.027	384×10^{-8}	159×10^{-9}	43.984	660×10^{-11}	51.082	115×10^{-10}	43.982	160×10^{-10}
37.021	355×10^{-8}	102×10^{-9}	51.077	535×10^{-11}	57.128	105×10^{-10}	51.076	133×10^{-10}
40.996	372×10^{-8}	134×10^{-9}	57.127	460×10^{-11}	71.051	819×10^{-11}	57.126	125×10^{-10}
43.981	293×10^{-8}	160×10^{-9}	71.050	343×10^{-11}	79.010	761×10^{-11}	71.050	970×10^{-11}
51.075	251×10^{-8}	978×10^{-10}	79.006	301×10^{-11}	83.156	710×10^{-11}	79.008	869×10^{-11}
57.125	221×10^{-8}	903×10^{-10}	83.154	276×10^{-11}			83.153	811×10^{-11}
					White			
71.049	184×10^{-8}	711×10^{-10}			18.038	77×10^{-11}		
79.003	167×10^{-8}	644×10^{-10}			19.591	54×10^{-11}		
83.151	150×10^{-8}	585×10^{-10}			26.985	Bkgd.		

TABLE 3.10 SUMMARY OF PRESHOT SOIL-SAMPLE SIEVE ANALYSIS

Soil samples obtained from the following locations:

#1 - surface at GZ.
#2 - surface to two feet deep 25 feet south of GZ.
#3 - two feet deep 25 feet south of GZ.
#4 - three feet deep 80 feet southwest of GZ.
#5 - six feet deep 100 feet south of GZ.

Size		Percent Less Than Stated Size				
U.S. Mesh	Microns (μ)	#1	#2	#3	#4	#5
7	2794	95.0		95.9		
12	1397		88.5		85.1	70.8
24	991		82.6		77.3	51.0
42	351		74.5		66.5	33.2
80	175		62.4		51.5	18.8
115	124	49.3	52.2	51.9	40.5	14.6
150	104	44.0	49.0	46.4	37.0	13.1
170	88	38.3	45.0	40.9	32.8	11.5
250	61	31.7	39.8	33.4	26.7	9.5
325	44	25.8	36.6	27.8	23.0	8.5
	30	19.4	29.1	23.3	17.9	7.7
	20	14.5	24.8	19.9	12.8	6.2
	10	9.7	19.4	13.9	8.8	4.3
	5	10.1	13.6	6.1	4.7	3.7
	3	6.8	10.0	5.0	4.2	3.6
	1	4.2	3.1	2.7	3.5	0.8

TABLE 3.11 ONE-HOUR LEACH STUDY AND LIMITED DECAY OF LEACH PRODUCTS FOR GROSS SAMPLE AND SELECTED CHARACTERISTIC GRAY, FUSED, AND WHITE FALLOUT PARTICLES FROM COLLECTOR 21A01

All readings (ma) taken in 4-pi ionization chamber.

Age	Gross Sample		Gray		Fused		White	
	Fallout	Filtrate	Fallout	Filtrate	Fallout	Filtrate	Fallout	Filtrate
days	ma	mc	ma	ma	ma	ma	ma	ma
2.199[a]	276×10^{-8}	139×10^{-10}	376×10^{-9}	970×10^{-11}	184×10^{-8}	92×10^{-11}	635×10^{-11}	201×10^{-11}
2.485	232×10^{-8}	139×10^{-10}	321×10^{-9}	930×10^{-11}	140×10^{-8}	118×10^{-11}	491×10^{-11}	196×10^{-11}
2.979	174×10^{-8}	112×10^{-10}	246×10^{-9}	800×10^{-11}	103×10^{-8}	109×10^{-11}	339×10^{-11}	176×10^{-11}
4.039	109×10^{-8}	786×10^{-11}	165×10^{-9}	560×10^{-11}	597×10^{-9}	668×10^{-12}	146×10^{-11}	109×10^{-11}
4.233	985×10^{-9}	760×10^{-11}	1[illegible]0 $\times 10^{-9}$	552×10^{-11}	547×10^{-9}	961×10^{-12}	142×10^{-11}	134×10^{-11}
4.983	832×10^{-9}	635×10^{-11}	128×10^{-9}	453×10^{-11}	433×10^{-9}	752×10^{-12}	1[illegible]0 $\times 10^{-11}$	103×10^{-11}

a. End of 1-hour leach period in 25 ml of pH 1 (HCl) which showed the following amounts of leaching:

Gross Sample	0.50%
Gray Particle	2.51%
Fused Particle	0.05%
White Particle	24.0 %

Dry fallout and filtrate were measured at additional ages to determine decay characteristics.

TABLE 3.12 LEACHING STUDIES ON SELECTED SAMPLES

All readings (ma) taken in 4-pi ionization chamber

Reagent	Particle Size	Age	Reading	Age	Reading	Leached
	μ	days	ma	days	ma	%
One-Day Leach Samples 01A0 3, 4, 5, 6 and 9 Combined						
		Fallout		**Filtrate**		
pH 1 (HCl)	88-175	13.583	192×10^{-11}	13.590	100×10^{-12}	5.0
pH 6 (H_2O)	88-175	13.584	192×10^{-11}	13.591	142×10^{-12}	6.9
pH 10 (NaOH)	88-175	13.584	209×10^{-11}	13.591	100×10^{-12}	4.6
pH 1 (HCl)	61-88	13.580	134×10^{-11}	13.593	100×10^{-12}	6.9
pH 6 (H_2O)	61-88	13.581	167×10^{-11}	13.593	100×10^{-12}	5.6
pH 10 (NaOH)	61-88	13.582	165×10^{-11}	13.594	100×10^{-12}	5.7
Three-Day Leach Samples 01A06 and 9 Combined						
		Fallout		**Filtrate**		
pH 1 (HCl)	88-175	15.369	332×10^{-11}	15.379	60×10^{-11}	15.3
pH 6 (H_2O)	88-175	15.376	244×10^{-11}	15.380	45×10^{-11}	15.6
pH 10 (NaOH)	88-175	15.378	236×10^{-11}	15.381	35×10^{-11}	12.9
pH 1 (HCl)	175-351	15.368	593×10^{-11}	15.378	89×10^{-11}	13.0
pH 6 (H_2O)	175-351	15.370	344×10^{-11}	15.379	52×10^{-11}	13.1
pH 10 (NaOH)	175-351	15.377	532×10^{-11}	15.380	39×10^{-11}	6.8
One-Day Leach Samples 31A05 and 8 Combined						
		Fallout		**Filtrate**		
pH 1 (HCl)	351-991	14.513	422×10^{-9}	14.519	549×10^{-11}	1.2
pH 6 (H_2O)	351-991	14.515	400×10^{-9}	14.523	113×10^{-11}	0.3
pH 10 (NaOH)	351-991	14.515	410×10^{-9}	14.531	99×10^{-11}	0.2
Seven-Day Leach Samples 31 A05 Plus 8						

This sample showed no measurable leaching for pH 1 (HCl), pH 6 (H_2O) and pH 10 (NaOH) on all particles studied (larger than 61 microns).

TABLE 3.13 EXCHANGE OF FALLOUT RADIOACTIVITY TO MONTMORILLONITE CLAY AND ADOBE SOIL

All measurements (ma) made in 4-pi ionization chamber

Reagent	Particle Size	Age	Reading	Age	Reading	Exchange
	μ	days	ma	days	ma	%
		One-Day Exchange of Samples 31A05 and 8 Combined				
		Fallout and Reagent		Reagent Only		
Adobe	351-991	14.513	410×10^{-9}	14.517	148×10^{-11}	0.4
Clay	351-991	14.513	405×10^{-9}	14.519	249×10^{-11}	0.6
		Three-Day Exchange of Samples 01A0 3, 4, 5, 6 and 9 Combined				
		Fallout and Reagent		Fallout Only		
Adobe	> 351	15.385	386×10^{-9}	15.427	383×10^{-9}	0.8
Clay	> 351	15.386	384×10^{-9}	15.428	374×10^{-9}	2.6
Adobe	175-351	15.388	675×10^{-11}	15.424	663×10^{-11}	1.8
Clay	175-351	15.388	130×10^{-10}	15.426	634×10^{-11}	51.2
Adobe	88-175	15.389	268×10^{-11}	15.425	216×10^{-11}	19.4
Clay	88-175	15.389	391×10^{-11}	15.426	373×10^{-11}	4.6
		Seven-Day Exchange of Samples 31A05 and 8 Combined				
		Fallout and Reagent		Reagent Only		
Adobe	> 351	19.124	310×10^{-9}	19.127	326×10^{-11}	1.1
Clay	> 351	19.125	331×10^{-9}	19.129	151×10^{-11}	0.5

TABLE 3.14 RADIONUCLIDE "R" VALUES BASED ON Mo^{99}

Sample Number	Sr^{89}	Sr^{90}	Y^{91}	Zr^{95}	Ru^{103}	Ru^{106}	I^{131}	Te^{132}	Cs^{136}	Cs^{137}	Ba^{140}	Ce^{141}	Ce^{144}
01 A07-7	0.0253	0.0723	0.273	0.874	0.754	0.149	0.0578	0.0358	4.20	0.229	0.212	-	0.927
01 A07-250	0.0276	0.0888	0.329	1.05	0.894	0.202	0.146	0.0520	1.20	0.0335	0.267	0.463	1.10
01 A07-PAN	0.0249	0.0742	0.288	0.821	0.585	0.178	0.0852	0.0557	1.02	0.0306	0.213	0.484	0.854
02 A02-1/4	0.0191	0.0591	0.199	0.776	1.27	0.186	0.113	0.0310	1.11	0.0445	0.150	0.315	0.907
02 A02-PAN	0.0299	0.125	0.232	0.824			1.05	0.0797	1.09	0.106	0.228	0.293	0.922
20 A04-12	0.0652	0.198	0.556	0.888			0.463	0.390	3.12	0.173	0.524	0.376	0.973
20 A04-80	0.0449	0.170	0.500	0.860			0.382	0.199	2.22	0.135	0.370	0.551	0.948
20 A04-PAN	0.136	0.536	1.07	0.965			1.96	0.853	8.30	0.518	0.841	0.992	1.10
20 A07-12	0.0235	0.0700	0.332	0.778			0.0312	0.0238	1.59	0.0616	0.254	0.248	0.921
20 A07-80	-	-	0.357	1.04	1.13	0.181	0.0197	0.0368	2.00	0.0681	0.254	0.354	0.937
20 A07-PAN	0.0317	0.103	0.357	0.761	0.990	0.305	0.0953	0.0848	2.72	0.0981	0.278	0.0381	0.925
827-I2-Cloud	0.648	0.635	5.[illegible]8	0.933			-	5.72	12.6	7.57	1.42	2.25	1.03
842-RI-1-Cloud	1.79	1.44	1.52	0.873			-	1.53	83.8	1.82	3.12	0.909	0.926
Expected Values	0.928	0.880	0.952	1.000	0.990	1.56	1.25	1.15	1.70	0.974	0.926	0.909	0.875

$$R = \frac{(X)_s/(Mo^{99})_s}{(X)_o/(Mo^{99})_o}$$

where X stands for the radionuclide of interest and the subscripts s and o refer to sample and standard respectively.

SECRET

TABLE 3.15 EQUIVALENT FISSIONS PER GRAM OF FOUR RADIONUCLIDES IN SELECTED SAMPLES

Duplicate analyses were made on all samples.
Sample Number 01A07-80 indicates material obtained from collector Number 7 at Station 01 and retained on a #80 U.S. sieve mesh.

Sample No.	Weight	Particle Size	Zr^{95}	Sr^{89}	Sr^{90}	Y^{91}
	g	microns	fis/g	fis/g	fis/g	fis/g
01A07-1/4	1.7	< 6350	7.30×10^{12}	2.47×10^{11}	7.15×10^{11}	
01A07-7	1.6	2830-6350	4.57×10^{13}	1.32×10^{12}	4.32×10^{12}	1.50×10^{13}
01A07-12	1.4	1651-2830	1.29×10^{14}	3.16×10^{12}	1.04×10^{13}	
01A07-24	1.0	701-1651	1.56×10^{14}	4.42×10^{12}	1.43×10^{14}	
01A07-42	0.6	350-701	1.40×10^{14}	4.35×10^{12}	1.43×10^{14}	
01A07-80	0.6	177-350	9.26×10^{13}	2.74×10^{12}	8.78×10^{12}	
01A07-170	1.2	88-177	2.39×10^{13}	7.00×10^{11}	2.21×10^{12}	
01A07-250	1.0	61-88	7.70×10^{12}	2.19×10^{11}	7.43×10^{11}	2.54×10^{12}
01A07-325	1.0	44-61	5.65×10^{12}	1.69×10^{11}	5.61×10^{11}	
01A07-Pan	1.7	< 44	4.70×10^{12}	1.54×10^{11}	4.36×10^{11}	1.73×10^{12}
02A02-1/4	2.73	< 6350	7.54×10^{11}	2.01×10^{10}	6.57×10^{10}	2.03×10^{11}
02A02-7	0.98	2830-6350	2.26×10^{9}			
02A02-12	1.16	1651-2830	1.29×10^{12}	2.50×10^{10}	8.38×10^{10}	
02A02-24	1.38	701-1651	3.89×10^{12}	8.58×10^{10}	2.83×10^{11}	
02A02-42	1.19	350-701	1.86×10^{12}	3.49×10^{10}	1.09×10^{11}	
02A02-80	2.20	177-350	5.62×10^{11}	1.15×10^{10}	3.64×10^{10}	
02A02-170	3.69	88-177	1.57×10^{11}			
02A02-250	1.60	61-88	5.14×10^{10}	1.34×10^{9}	1.15×10^{10}	
02A02-325	1.45	44-61	1.11×10^{11}	3.84×10^{9}	1.67×10^{10}	
02A02-Pan	2.02	< 44	1.77×10^{11}	6.92×10^{9}	3.05×10^{10}	6.35×10^{10}
20A04-7	0.5	< 2830				
20A04-24	0.20	701-1651	2.40×10^{13}	1.42×10^{12}	5.02×10^{12}	
20A04-42	0.13	350-701				
20A04-12	0.25	1651-2830	2.21×10^{12}	1.76×10^{11}	5.64×10^{11}	
20A04-80	0.20	177-350	8.72×10^{11}	4.92×10^{10}	1.96×10^{11}	5.33×10^{11}
20A04-170	0.68	88-177	1.56×10^{11}	1.20×10^{10}	5.20×10^{10}	
20A04-325	1.92	44-88	3.41×10^{10}	3.39×10^{9}	1.58×10^{10}	
20A04-Pan	1.50	< 44	2.01×10^{10}	3.07×10^{9}	1.28×10^{10}	2.35×10^{10}
20A07-7	2.65	2830-6350	2.29×10^{12}	[illegible]$.85 \times 10^{10}$	2.87×10^{11}	
20A07-12	1.59	1651-2830	8.71×10^{11}	2.84×10^{10}	8.96×10^{10}	3.91×10^{11}
20A07-24	1.66	701-1651	1.09×10^{12}	5.81×10^{10}	1.85×10^{11}	
20A07-42	1.71	350-701	9.73×10^{11}	3.45×10^{10}	1.13×10^{11}	
20A07-80	1.70	177-350	1.85×10^{12}			6.67×10^{11}
20A07-170	1.69	88-177	9.86×10^{11}	3.61×10^{10}	1.21×10^{11}	
20A07-325	2.82	44-88	3.87×10^{11}	1.66×10^{10}	5.36×10^{10}	
20A07-Pan	3.13	< 44	1.83×10^{11}	8.27×10^{9}	2.84×10^{10}	9.06×10^{10}
11A07-#4		Part of total	5.25×10^{13}	1.88×10^{12}	6.38×10^{12}	3.05×10^{13}
21A03-#5			5.39×10^{13}	1.75×10^{12}	6.14×10^{12}	3.21×10^{13}
21A04-#4			7.39×10^{13}	3.11×10^{12}	1.05×10^{13}	4.44×10^{13}
13A03	2.45	Total	5.24×10^{10}	5.40×10^{9}	1.94×10^{10}	3.07×10^{10}
13A04	2.13	Total	8.18×10^{10}	5.29×10^{9}	2.96×10^{10}	4.37×10^{10}
23A03	0.35[illegible]	Total	6.29×10^{10}	7.99×10^{9}	2.96×10^{10}	5.25×10^{10}
23A04	0.880	Total	4.79×10^{10}	1.20×10^{10}	4.56×10^{10}	8.09×10^{10}
31A03	24.50	Total	7.88×10^{13}	3.07×10^{12}	8.98×10^{12}	5.15×10^{13}
827-12 Cloud	-	Total	2.96×10^{13}	2.23×10^{13}	2.30×10^{13}	1.83×10^{14}
842 R11-Cloud	-	Total	1.59×10^{13}	3.52×10^{13}	2.99×10^{13}	2.90×10^{13}

TABLE 3.16 EQUIVALENT FISSIONS PER GRAM OF TWELVE RADIONUCLIDES IN SELECTED SAMPLES

Duplicate analyses were made on all samples.
Sample Number 01A07-80 indicates material obtained from collector Number 7 at Station 01 and retained on a #80 U.S. sieve mesh.

Sample No.	Weight	Particle Size	Mo^{99}	Ru^{103}	Ru^{106}	I^{131}	Te^{132}
	g	microns	fis/g	fis/g	fis/g	fis/g	fis/g
01A07-1/4	1.7	6350					
01A07-7	1.[illegible]	2830-6350	5.24×10^{13}	3.99×10^{13}	5.01×10^{12}	2.42×10^{12}	1.63×10^{12}
01A07-12	1.4	1651-2830					
01A07-24	1.0	701-1651					
01A07-42	0.6	350-701					
01A07-80	0.6	177-350					
01A07-170	1.2	88-177					
01A07-250	1.0	61-88	7.34×10^{12}	6.63×10^{12}	9.50×10^{11}	8.58×10^{11}	3.32×10^{11}
01A07-325	1.0	44-61					
01A07-Pan	1.7	44	5.74×10^{12}	3.39×10^{12}	6.55×10^{11}	3.91×10^{11}	2.78×10^{11}
02A02-1/4	2.73	6350	9.74×10^{11}	1.25×10^{12}	1.16×10^{11}	8.80×10^{10}	2.62×10^{10}
02A02-7	[illegible]	2830-6350					
02A02-12	[illegible].16	1651-2830					
02A02-24	1.38	701-1651					
02A02-42	1.19	350-701					
02A02-80	2.20	177-350					
02A02-170	3.69	88-177					
02A02-250	1.60	61-88					
02A02-325	1.45	44-61					
02A02-Pan	2.02	44	2.15×10^{11}			1.80×10^{11}	1.49×10^{10}
20A04-7	0.5	2830					
-24	0.20	701-1651					
-42	0.13	350-701					
20A04-12	0.25	1651-2830	2.50×10^{12}			9.25×10^{11}	8.46×10^{11}
20A04-80	0.20	177-350	1.02×10^{12}			3.10×10^{11}	1.76×10^{11}
20A04-170	0.68	88-177					
20A04-325	1.92	44-88					
20A04-Pan	1.50	44	2.09×10^{10}			3.28×10^{10}	1.55×10^{10}
20A07-7	2.65	2830-6350					
20A07-12	1.59	1651-2830	1.12×10^{12}			2.80×10^{10}	2.32×10^{10}
20A07-24	1.66	701-1651					
20A07-42	1.71	350-701					
20A07-80	1.70	177-350	1.78×10^{12}	2.03×10^{12}	2.07×10^{11}	2.80×10^{10}	5.69×10^{10}
20A07-170	1.69	88-177					
20A07-325	2.82	44-88					
20A07-Pan	3.13	44	2.41×10^{11}	2.11×10^{11}	4.73×10^{10}	1.84×10^{10}	1.78×10^{10}
11A07-#4		Part of Total					
21A03-#5							
21A04-#4							
13A03	2.45	Total					
13A04	2.13	Total					
23A03	0.359	Total					
23A04	0.880	Total					
31A03	24.50	Total					
827-L2 Cloud	-	Total	3.18×10^{13}				1.58×10^{14}
842-R11 Cloud	-	Total	$1.8[illegible] \times 10^{13}$				2.42×10^{13}

Continued

TABLE 3.1 EQUIVALENT FISSIONS PER GRAM OF TWELVE RADIONUCLIDES IN SELECTED SAMPLES (Contd)

Duplicate analyses were made on all samples.
Sample Number 01A07-80 indicates material obtained from collector Number 7 at Station 01 and retained on a #80 U.S. sieve mesh.

Sample No.	Weight	Particle Size	Cs^{136}	Cs^{137}	Ba^{140}	Ce^{141}	Ce^{144}	Pu^{239}	Np^{239}
	g	microns	fis/g	fis/g	fis/g	fis/g	fis/g	atoms/g	atoms/g
01A07-3/4	1.7	< 6350							
01A07-7	1.6	2830-6350	1.29×10^{14}	1.23×10^{12}	1.20×10^{13}		5.54×10^{13}	1.613×10^{11}	1.690×10^{11}
01A07-12	1.4	1651-2830							
01A07-24	1.0	701-1651							
01A07-42	0.6	350-701							
01A07-80	0.6	177-350							
01A07-170	1.2	88-177							
01A07-250	1.0	61-88	5.20×10^{12}	2.53×10^{11}	2.12×10^{12}	3.74×10^{12}	9.19×10^{12}	1.982×10^{11}	3.16×10^{10}
01A07-325	1.0	44-61							
01A07-Pan	1.7	< 44	3.43×10^{12}	1.81×10^{11}	1.32×10^{12}	3.05×10^{12}	5.59×10^{12}	3.28×10^{11}	2.103×10^{10}
02A02-3/4	2.73	< 6350	6.35×10^{11}	4.46×10^{10}	1.58×10^{11}	3.38×10^{11}	1.01×10^{12}	1.147×10^{11}	2.042×10^{9}
02A02-7	0.98	2830-6350							
02A02-12	1.16	1651-2830							
02A02-24	1.38	701-1651							
02A02-42	1.19	350-701							
02A02-80	2.20	177-350							
02A02-170	3.69	88-177							
02A02-250	1.60	61-88							
02A02-325	1.45	44-61							
02A02-Pan	2.02	< 44	1.37×10^{11}	2.35×10^{10}	5.29×10^{10}	6.91×10^{10}	1.26×10^{11}	1.266×10^{11}	8.12×10^{8}
20A04-7	0.5	< 2830							
-24	0.20	701-1651							
-42	0.13	350-701							
20A04-12	0.25	1651-2830	4.59×10^{12}	4.44×10^{11}	1.41×10^{12}	$< 1.03 \times 10^{12}$	2.77×10^{12}	6.96×10^{12}	3.07×10^{10}
20A04-80	0.20	177-350	1.32×10^{12}	1.41×10^{11}	4.06×10^{11}	6.16×10^{11}	1.10×10^{12}	2.076×10^{10}	8.98×10^{9}
20A04-170	0.68	88-177							
20A04-325	1.92	44-88							
20A04-Pan	1.50	< 44	1.02×10^{11}	1.11×10^{10}	1.90×10^{10}	2.28×10^{10}	2.63×10^{10}	7.66×10^{10}	1.3×10^{8}
20A07-7	2.65	2830-6350							
20A07-12	1.59	1651-2830	1.05×10^{12}	7.12×10^{10}	3.08×10^{11}	3.06×10^{11}	1.18×10^{12}	8.80×10^{9}	4.36×10^{9}
20A07-24	1.66	701-1651							
20A07-42	1.71	350-701							
20A07-80	1.70	177-350	2.09×10^{12}	1.25×10^{11}	4.88×10^{11}	6.93×10^{11}	1.90×10^{12}	1.134×10^{10}	7.08×10^{9}
20A07-170	1.69	88-177							
20A07-325	2.02	44-88							
20A07-Pan	3.13	< 44	3.86×10^{11}	2.44×10^{10}	7.26×10^{10}	1.10×10^{11}	2.55×10^{11}	1.392×10^{11}	1.164×10^{9}
11A07-[illegible]		Part of total							
21A03-[illegible]									
21A04-[illegible]									
13A03	2.45	Total							
13A04	2.13	Total							
23A03	0.359	Total							
23A04	0.880	Total							
31A03	24.50	Total							
827-L2-Cloud	-	Total	$< 2.35 \times 10^{14}$	2.48×10^{14}	4.88×10^{13}	7.85×10^{13}	3.72×10^{13}	1.504×10^{12}	1.380×10^{12}
842-R11-Cloud	-	Total	5.97×10^{14}	7.42×10^{13}	6.13×10^{13}	1.82×10^{13}	1.92×10^{13}	9.48×10^{11}	2.835×10^{11}

TABLE [illegible] WEIGHT [illegible] [illegible] [illegible] [illegible]
[illegible] ACTIVITY [illegible] [illegible] [illegible]

Size Fraction μ	Weight of Fraction g	Percent of Total Weight	Relative Activity, r*	[illegible]	[illegible]
				A. Sample No. [illegible]	
< 1[illegible]	1.[illegible]	2.2	4.00	[illegible]	[illegible] material.
100-[illegible]	2.7720	3.1	> 5.00	[illegible]	[illegible]
200-53[illegible]	2.7945	3.1	> 5.0[illegible]	White [illegible] [illegible]	[illegible] active, clear [illegible] [illegible]
				[illegible]	[illegible] active, [illegible] [illegible]
				[illegible] material, [illegible]	Inactive [illegible] [illegible]
5[illegible]	4.5[illegible]	5.1	> 5.00	[illegible]	As above.
1,[illegible]	77.[illegible]	[illegible]	> 5.00	Coated pebbles, [illegible] Other pebbles, [illegible]	[illegible] inactive pebbles with [illegible] [illegible] [illegible] inactive pebbles. [illegible]
				B. Sample No. [illegible] Tube [illegible]	
< 10[illegible]	1.[illegible]	[illegible]	3.	[illegible]	[illegible] active [illegible] [illegible] and partially [illegible] [illegible] soil.
100-2[illegible]	1.2[illegible]	2.5	> 5.00	[illegible] [illegible] material, [illegible]	[illegible] 50[illegible] active, clear and [illegible]
200-5[illegible]	1.2[illegible]	2.5	> 5.00	White pebbles, [illegible] Other pebbles, [illegible]	irregular particles. 50[illegible] [illegible] with [illegible] particle.
530-1,[illegible]	3.3614	4.2	> 5.00	Vesicular material, [illegible] Other, 2.45	[illegible]
> 1,[illegible]	70.3941	[illegible]8.7	> 5.00	Vesicular material, [illegible] Other, 2.45.	As above.
				C. Sample No. [illegible] Tube	
< 1[illegible]	1.2607	1.5	2.7	2.[illegible]	Inactive soil
100-2[illegible]	1.5520	1.[illegible]	> 5.00	[illegible]	Inactive soil
200-5[illegible]	1.8941	2.[illegible]	> 5.00	[illegible]	50[illegible] active, clear and [illegible] [illegible] inactive soil with [illegible]
[illegible]-1,000	4.5754	5.5	> 5.00	Vesicular, [illegible]	[illegible] active, [illegible] particles. 5[illegible] inactive [illegible]
> 1,000	74.2415	[illegible]	> 5.00		As above.
				D. Sample No. [illegible] Tube [illegible]	
< 100	1.[illegible]	1.2	2.20	2.[illegible]	Inactive soil.
100-[illegible]	1.5319	1.[illegible]	> 5.00	2.[illegible]	Inactive soil.
200-[illegible]	1.2307	1.4	> 5.00	[illegible]	50[illegible] active, clear [illegible] particles. [illegible] inactive soil particles.
530-[illegible]	3.0[illegible]5	4.2	> 5.00	Vesicular, [illegible] Other, [illegible]	5[illegible] active, vesicular, clear and [illegible] [illegible] and similar [illegible] [illegible] soil with [illegible] particles.
> [illegible],000	79.1[illegible]	[illegible].4	> 5.00	Vesicular, [illegible] Other, [illegible]	[illegible] active, glassy, vesicular and [illegible] pebbles with [illegible] particles.

* [illegible] Fisher survey.
** Inactive signifies that images were not obtained on autoradiograph after 3-day exposure.
*** [illegible] percentages represent percentages of total number of particles.

TABLE 3.18 ANALYSIS OF SAMPLES BY SEMIQUANTITATIVE EMISSION SPECTROGRAPHY. PERCENT BY WEIGHT OF ELEMENTS IN SELECTED, SCREENED FRACTION OF TOTAL SAMPLE

Element (As Oxide)	Sample No. and Size Fraction					
	11-AO-7-2 > 1000 μ	11-AO-7-29 200-530 μ	11-AO-7-39 < 100 μ	11-AO-7-6 200-530 μ	11-AO-7-7 > 1000 μ	245-4 left (Cloud Sample)
B	0.01	0.01	-	0.01	0.02	0.02
Na	4	3.5	2.5	2	2	2
Mg	0.15	0.75	0.5	0.5	0.9	1
Al	15	17.5	10	12.5	12.5	15
Ag	-	-	-	-	-	0.002
K	7	6	4.5	5	2	2.5
Ca	0.6	3.5	1.5	1.75	1.5	4.5
Ti	0.15	0.45	0.4	0.35	0.5	0.35
V	-	0.004	0.006	0.005	[illegible]	0.004
Cr	-	0.002	0.002	0.002	0.003	0.003
Mn	0.15	15	0.07	0.06	0.12	0.08
Fe	2.75	4	3	3.5	3	3
Co	-	-	-	-	-	-
Ni	-	0.001	0.001	0.002	0.002	0.004
Cu	<0.001	0.003	0.001	0.002	0.002	0.04
Zn	-	-	-	-	-	0.1
Ga	0.005	0.033	0.002	0.001	0.002	0.002
Sr	0.1	0.05	0.04	0.04	0.1	0.07
Y	0.015	0.01	-	-	-	-
Yb	0.002	0.001	-	-	-	-
Cd	-	-	-	-	-	-
Sn	-	0.001	-	-	-	0.002
Ce	0.05	-	-	-	-	-
Be	0.015	0.1	0.06	0.07	0.08	0.08
La	0.02	-	-	-	-	-
Pb	0.003	0.002	-	0.002	0.003	0.02
Si + non-detectables (balance)	69.966	63.948	77.41	74.148	87.249	71.208

TABLE 3.19 CONDITIONS OF COLLECTION, WEIGHTS, RELATIVE ACTIVITIES OF SAMPLES, TYPES OF PARTICLES, AND DISTRIBUTION OF ACTIVITY OBTAINED FROM CLOUD BY AIRCRAFT

Sample No.	Conditions of Collection	Total Weight of Particulates, g*	Relative Activity**	Type of Particles and Distribution of Activity***
245-Right Wing	54 min after shot. 13,700-ft altitude	0.0209	0.60	About 90% of the particles of all sizes appear to be active silicates mostly associated with soil. The particles range from about 2 to 30 μ in diam. The median diameter is 8 μ, and 98% of the particles are between 3 and 20 μ in diam. There may have been a change in the particle size distribution due to exposure to the monatomic oxygen flame.
245-Left Wing	48 min after shot. 12,000-ft altitude	0.0313	1.10	As above.

* Samples collected on low-ash, IPC filter paper. Paper was subsequently ashed in monatomic oxygen torch.

** Calibrated Fisher survey meter in contact with glass weighing bottle containing ashed sample.

***Density not obtained due to insufficient quantity of sample.

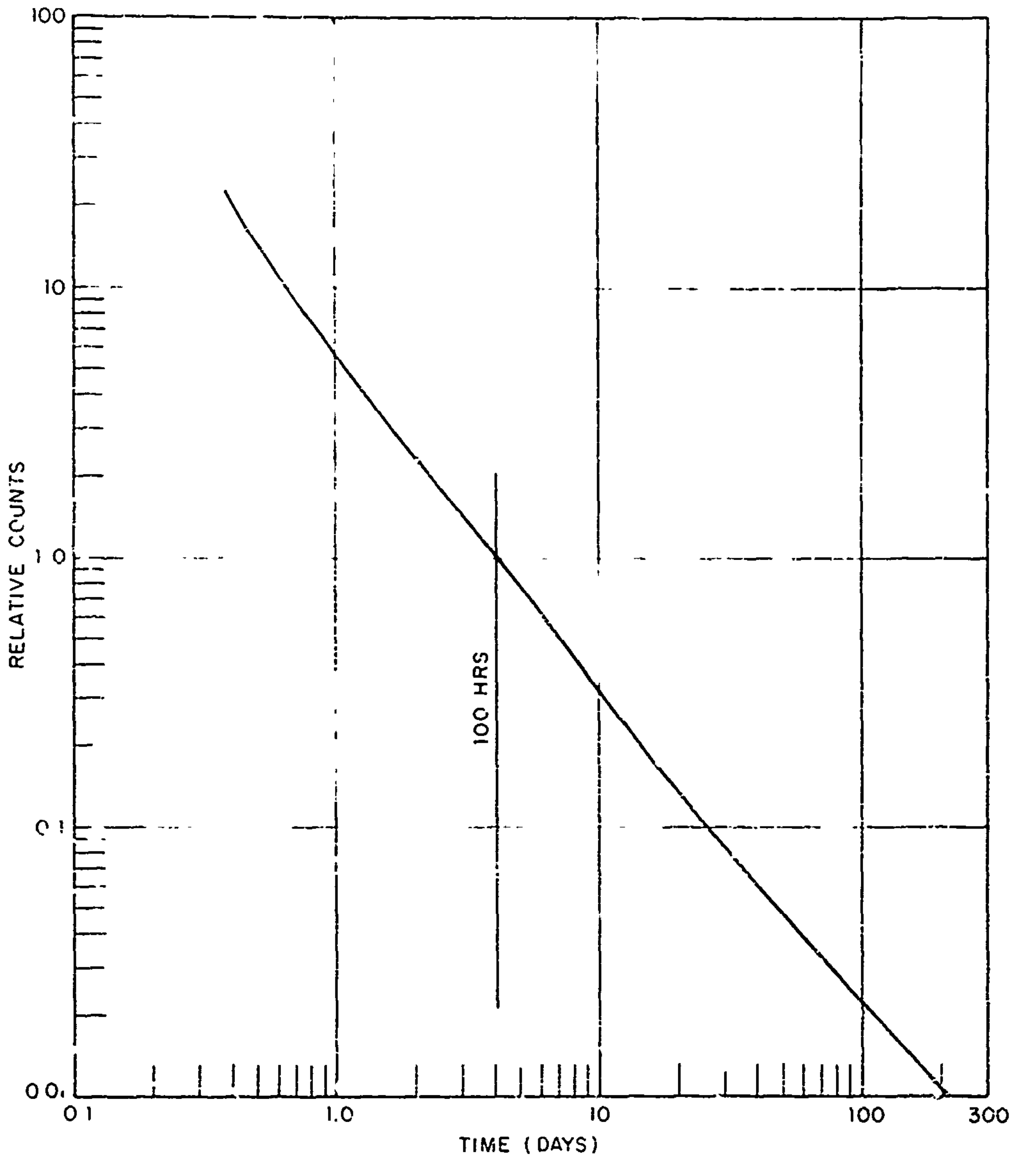


Figure 3.1 Composite cathouse-counter decay curve obtained from individual decay curves for Stations 01, 02, 12, 30, and 31

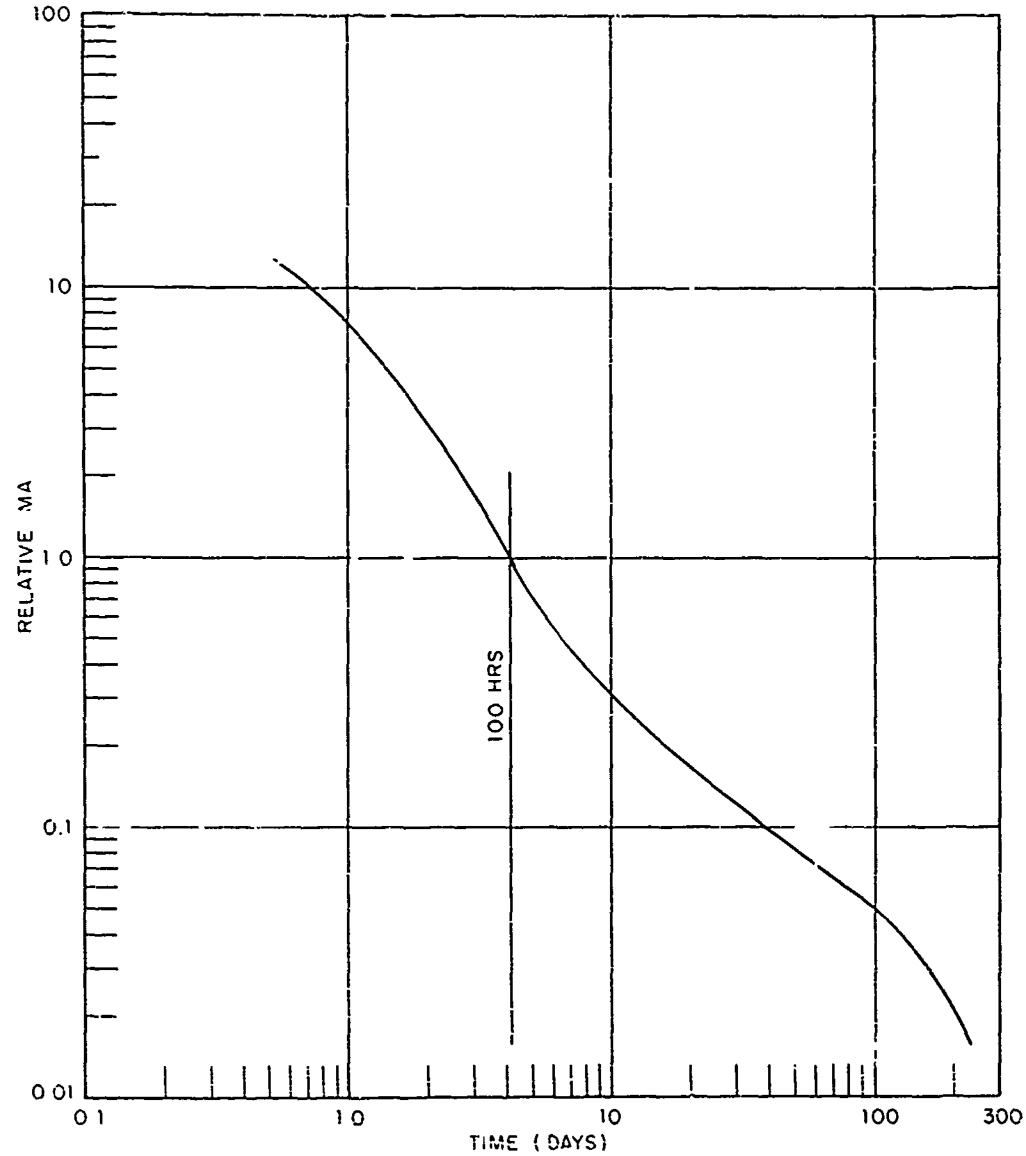


Figure 3.2 Composite 4-pi ion-chamber decay curves obtained from individual decay curves of nine sieve fractions from Station 01.

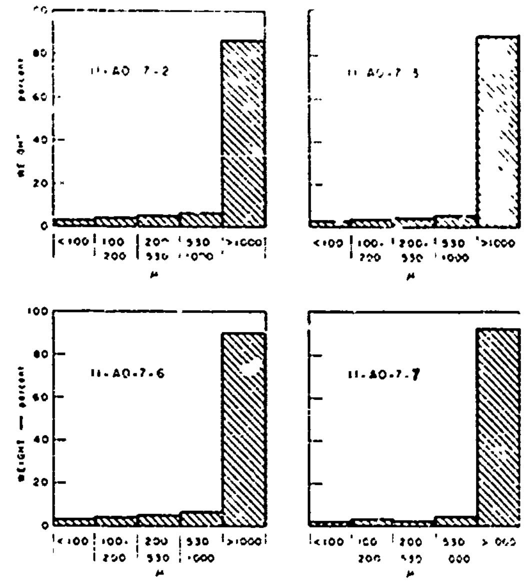


Figure 3.3 Distribution of particle weight of four 11A07 gross samples.

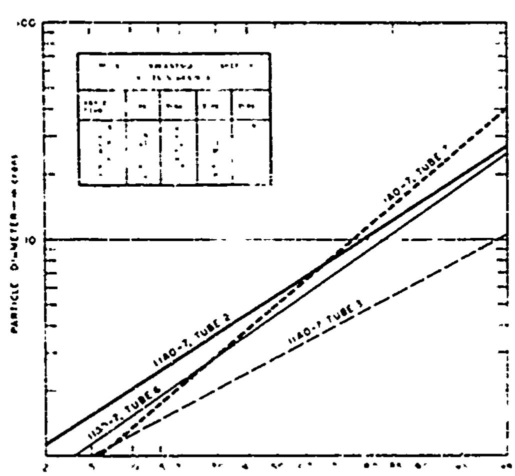
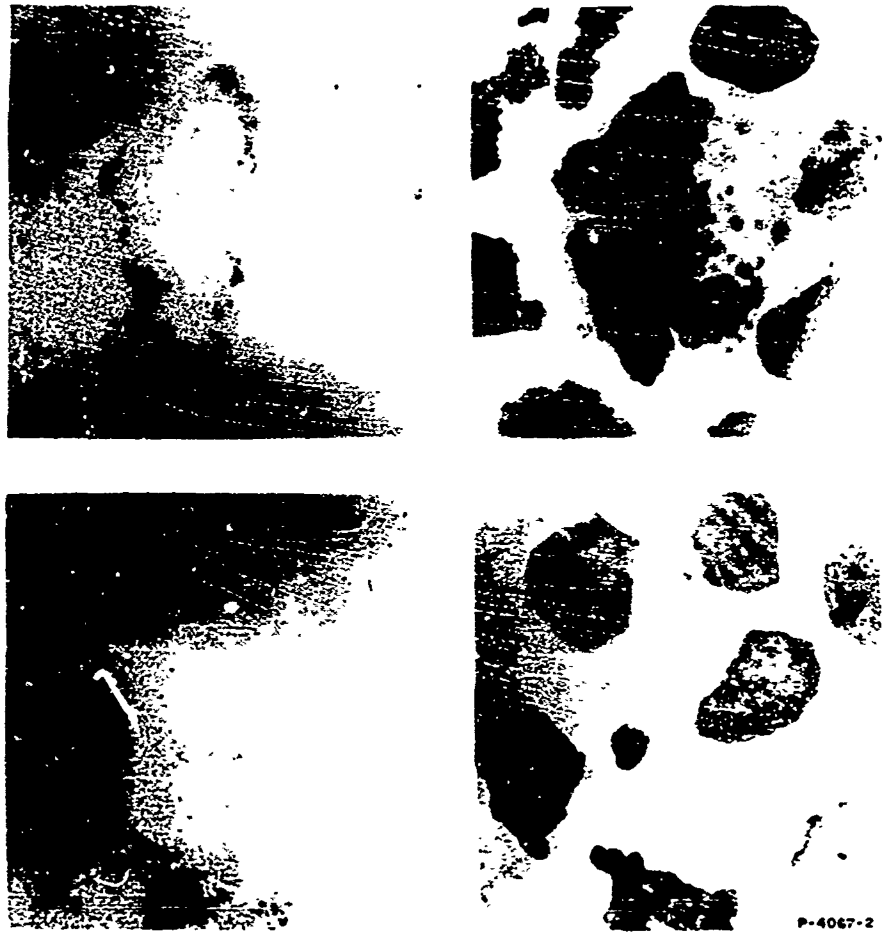


Figure 3.4 Cumulative particle-size distributions of four 11A07 gross samples.

Figure 3.5 Photomicrograph and autoradiograph of selected fallout particles. Active, vesicular, clear and black glassy materials associated with inactive alluvial material at surface of particle or within particle. (MSS-145(SL)-4-63)



Autoradiograph

Photomicrograph

Figure 3.6 Photomicrographs and autoradiographs of selected fallout particles. Active glassy coating of inactive pebble, active vesicular glassy particles, and inactive pebbles.

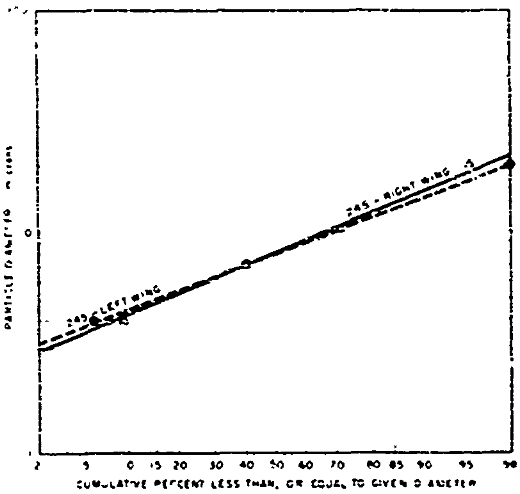


Figure 3.7 Cumulative particle-size distribution in cloud samples described in Table 3.19.

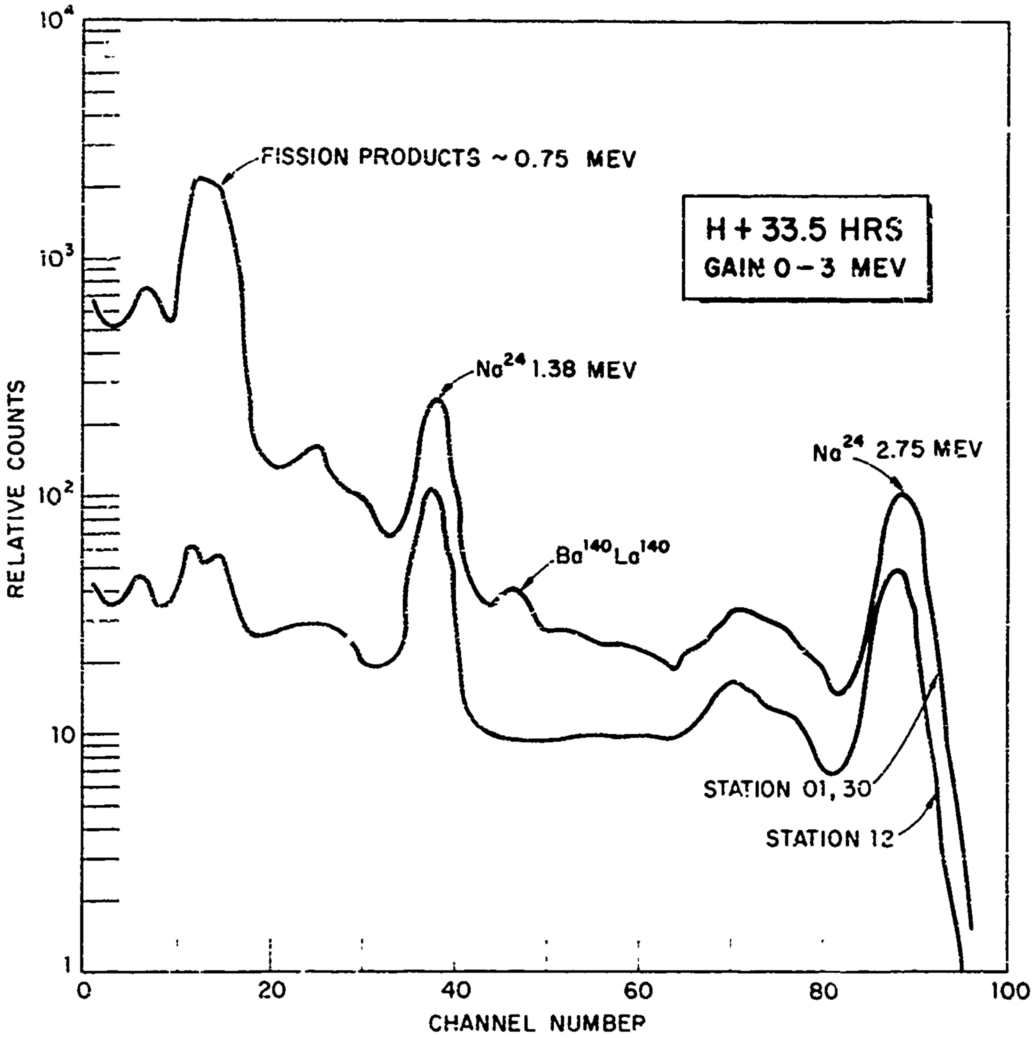


Figure 3.8 Gamma ray spectra plots of gross samples from Stations 01, 12, and 30 (0.5-gm sample).

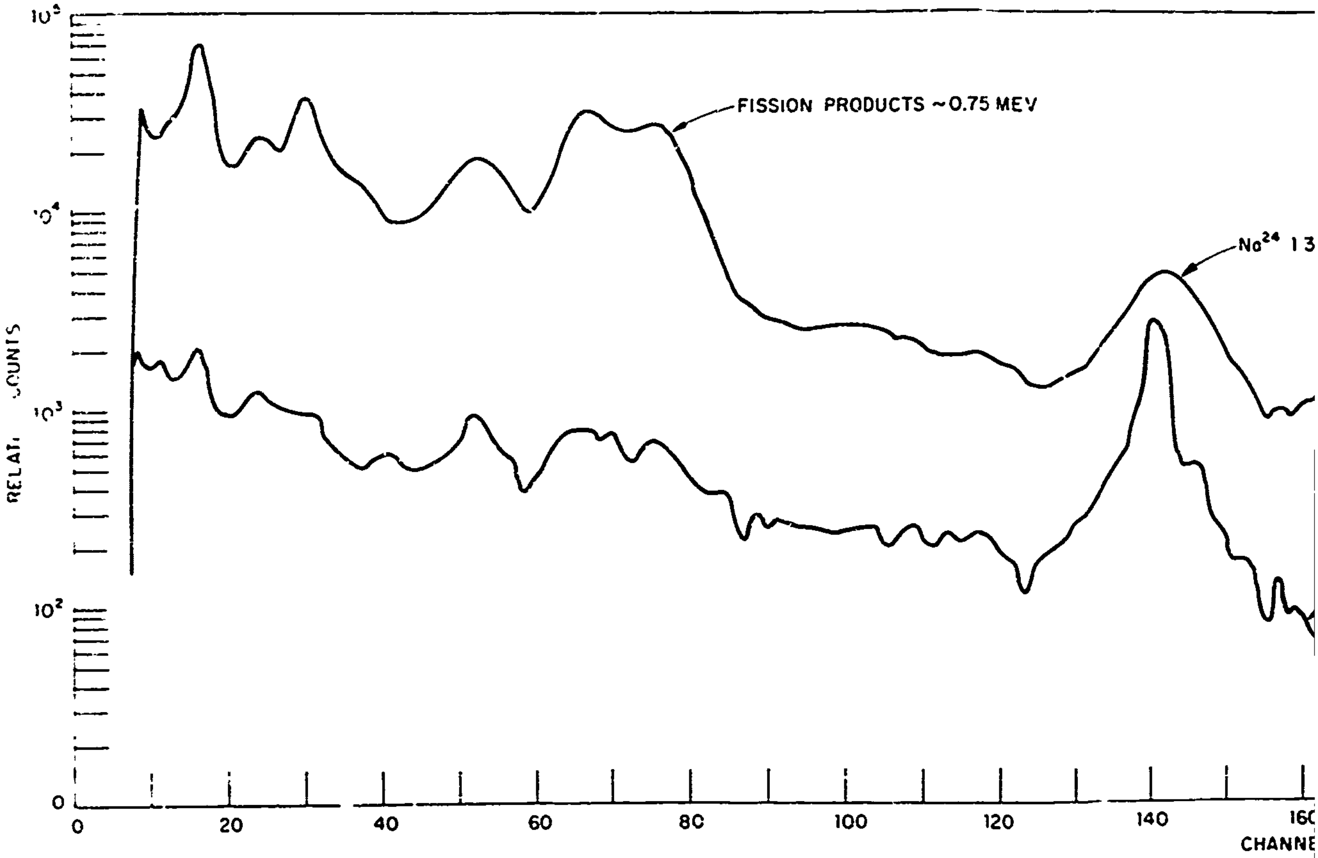
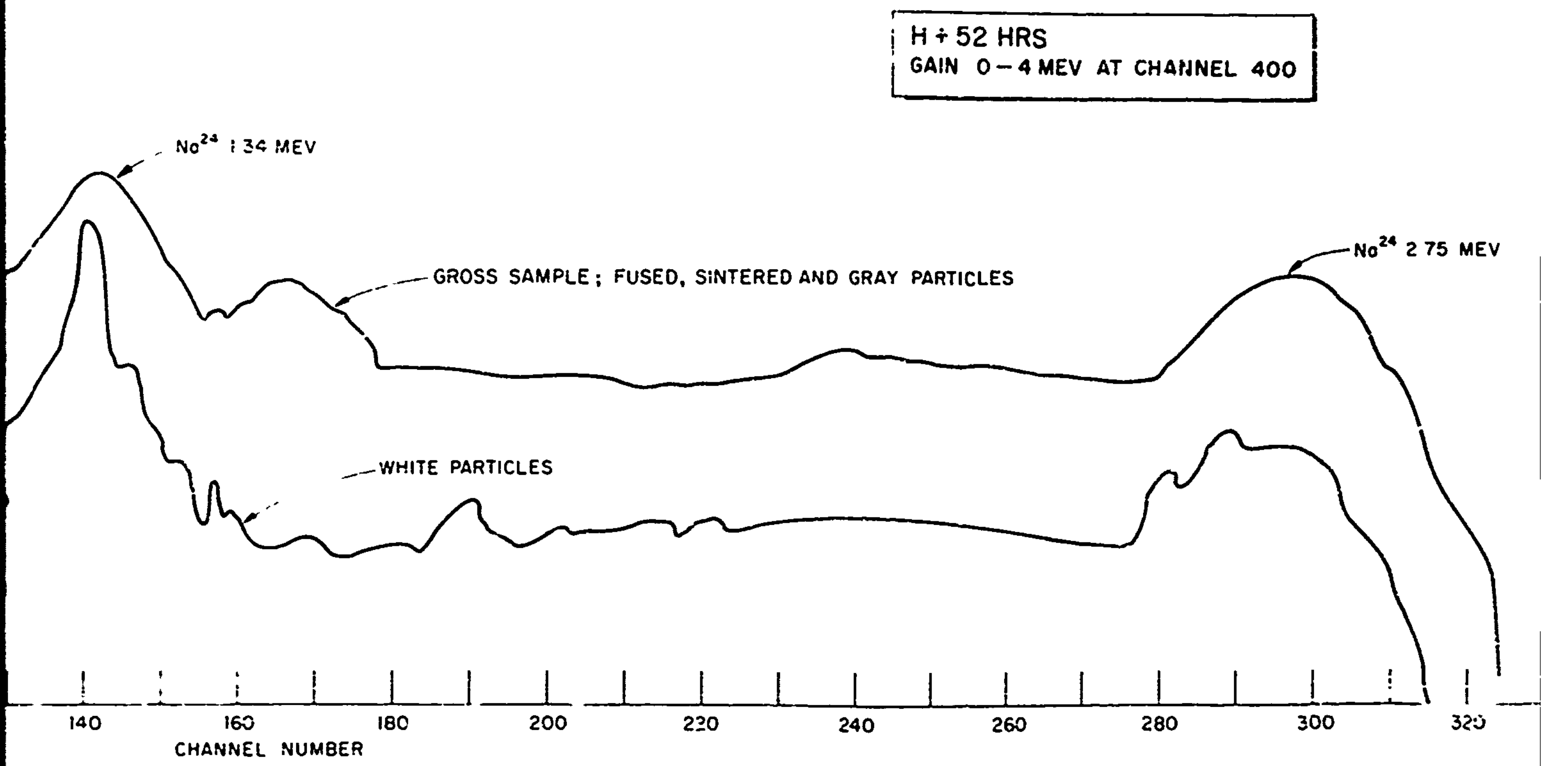


Figure 3.9 Gamma ray spectra
sample and selected characteri



Gamma ray spectra plots for Station 21A01 gross
d selected characteristic particles.

2

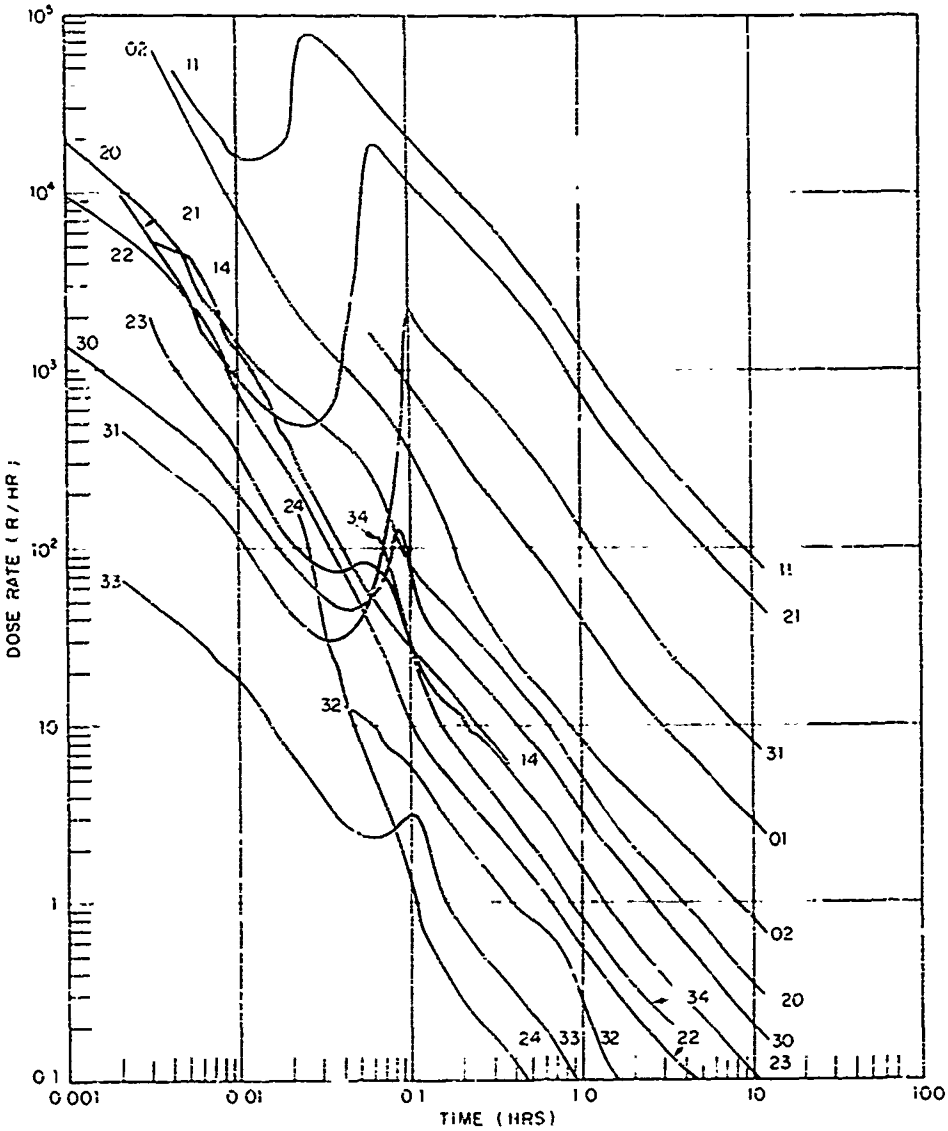


Figure 3 10 Radiation dose-rate histories at fallout-collector stations.

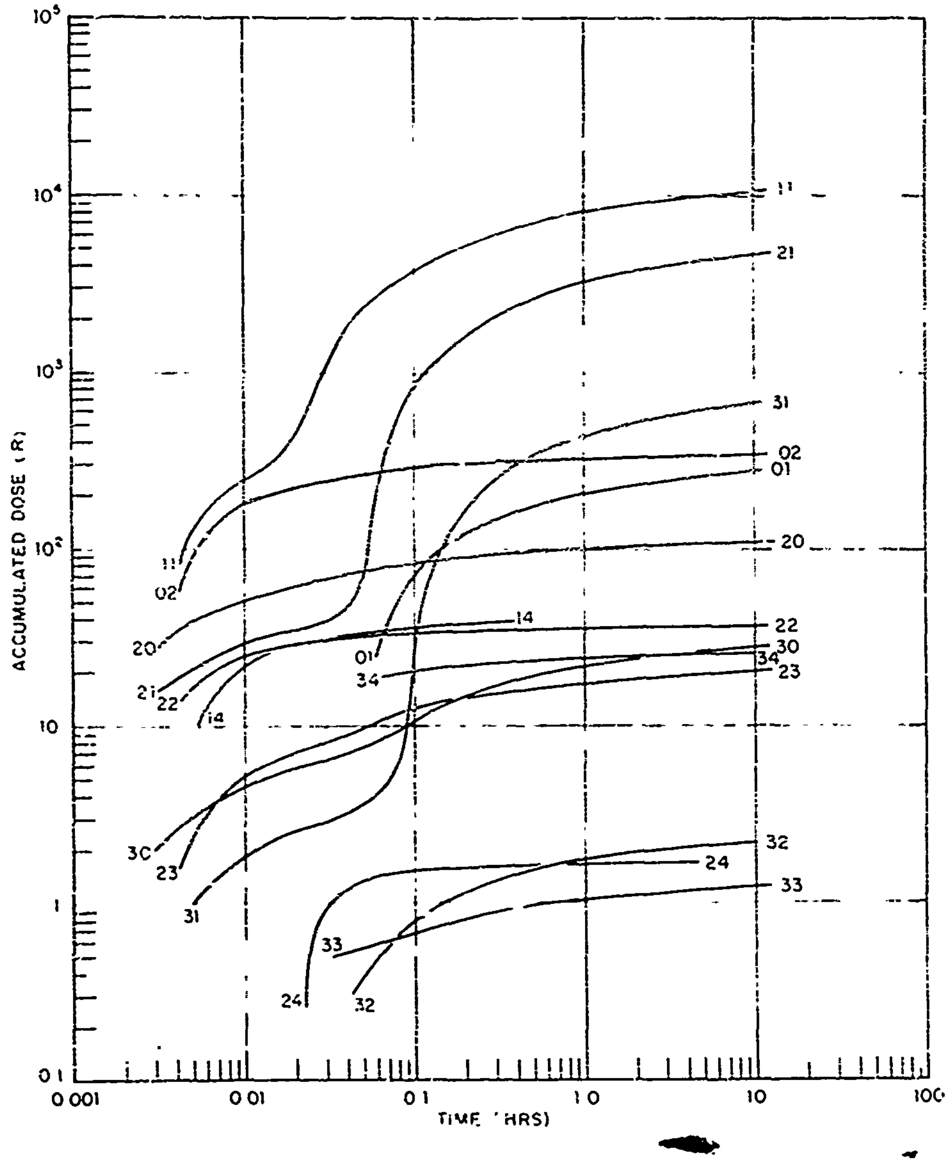


Figure 3.11 Radiation-dose histories at fallout-collector stations.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

The quality of measurements made by this project was better than that of previous weapon-test field work because of the improved instrumentation and past experience of project personnel. In addition to gathering sufficient data to meet the objectives of the project, participation in the Johnie Boy event provided a pilot study in recently developed sample recovery, handling, and analysis techniques that was to prove beneficial in obtaining data from the Small Boy event.

In contrast to the unstable shot-time winds at the Small Boy event, the Johnie Boy wind structure should offer the fallout modelmakers an experimental check point. Relatively steady-state wind conditions during the short duration (about 0.1 hour) of the close-in fallout event should provide reliable input for models where time and spatial variations of winds are not considered. However, recognition of the weapon geometry (23-inch burial), crater volume, and particle size-activity relationships will probably be required for successful prediction of fallout patterns. Unfortunately, time-incremental collections were not pos-

sible and an important source of fallout-model input was not available.

Performance of the basic fallout collectors was very satisfactory and the type of fallout collected was easily recovered for analysis. Although some background material may be present in the samples, the amount is very low because of the stable nature of the surrounding soil.

Particle-size and gamma-activity distribution data has been reported but not interpreted. Active fallout particles were formed that were larger than the native soil particles originally present in the vicinity of ground zero. The elemental compositions of samples analyzed was generally similar to that of Operation Jangle samples. The number of active particles ranged from 0 to 50 percent with the larger particle size ranges having a higher percent of active particles.

Leaching of radioactivity was generally greater for longer time periods and for pH 1 (HCl) solutions. About 15 percent of the radioactivity was leached from the fallout from one station during a 3-day leach time between 12 and 15 days after the shot. One early-time 1-hour leaching test showed 0- to 25-percent of activity leached, and one later 7-day leach test showed no measurable leaching. Fused particles showed less leaching (by factors of 10 to 50)

than other selected characteristic particles with identical gamma-ray spectral analyses. This indicates little surface radioactivity and that the physical state probably has a great influence on solubility of radionuclides.

Exchange of radioactivity from fallout was generally higher for montmorillonite clay (0.5 to 51.2 percent) than for adobe soil (0.4 to 19.4 percent). As with leaching, physical state of the material seemed to have an effect on activity exchange rates.

The air ionization rate (r/hr) variation with time 3 feet above the ground at a majority of the fallout collection stations was successfully documented. Dose (r) histories were determined on individual relative bases starting from arbitrary times because of uncertainties in the initial gamma dose due to terrain shielding and weapon detonation geometry.

The similar slopes of the decay portion of the dose-rate history curves at many stations indicates little relative fractionation of radioactivity from station to station. The computed "R" values confirm this relationship. However the "R" values measured are different from those found in unfractionated fission products. Between H+1 and H+10 hours the decay rate approximates $t^{-1.2}$ within the range of $t^{-1.1}$ to $t^{-1.3}$.

APPENDIX A

GAMMA DOSE RATE AND DOSE-VERSUS-TIME TABLE

Table A.1 consists of reduced data incorporating all corrections and interpretations that could reasonably be made to obtain data from a maximum number of stations. Uncertainties in the accuracy of the dose values are explained in Section 3.3.

TABLE A.1 DOSE RATE AND DOSE VERSUS TIME AT INDICATED LOCATIONS

Station 01			Station 02			Station 11		
Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)
0.0593	1613.4	24.315	0.0032	65344	0	0.0031	109650	0
0.0645	1432.6	32.290	0.0042	47193	56.26	0.0042	49451	82.8
0.070[illegible]	1299.9	40.513	0.0063	20889	127.1	0.0062	23022	163.4
0.0760	1131.0	47.259	0.0084	12252	161.6	0.0094	16702	232.5
0.0801	1107.3	52.020	0.0094	8168	172.1	0.0135	15285	298.3
0.0[illegible]95	962.59	61.695	0.0115	5940	186.[illegible]	0.0167	17274	349.3
0.0947	[illegible]9.24	66.525	0.0136	4575	200.1	0.020[illegible]	2251[illegible]	429.7
0.10[illegible]	[illegible]22.03	72.[illegible]50	0.014[illegible]	3672	204.3	0.0240	74177	584.5
0.1092	737.15	7[illegible].340	0.0167	3068	211.3	0.0260	76425	741.4
0.1207	659.02	[illegible].312	0.0209	2319	220.[illegible]	0.0292	76425	934.0
0.1290	595.04	91.493	0.0313	1433	238.4	0.0333	68163	1280.5
0.1404	527.60	97.913	0.0406	1107	250.2	0.0396	6004[illegible]	1675.1
0.150[illegible]	4[illegible]0.39	103.12	0.0500	[illegible]9.5	259.5	0.044[illegible]	52542	1959.5
0.1602	437.0	107.4	0.0603	726.[illegible]	267.8	0.0[illegible]0[illegible]	45036	2223.0
0.170[illegible]	403.0	111.[illegible]	0.0707	601.2	274.7	0.0[illegible]04	36029	2650.0
0.1799	372.[illegible]	115.4	0.0811	494.9	280.3	0.0698	31136	2953.0
0.1893	346.0	11[illegible].[illegible]	0.0905	421.5	294.6	0.0802	26[illegible]30	3260.0
0.1996	322.3	121.9	0.1008	359.9	2[illegible].7	0.0906	23570	3521.0
0.2101	302.56	125.5	0.1495	159.8	300.[illegible]	0.1000	21017	3731.0
0.2215	278.6	12[illegible].	0.1897	100.2	306.1	0.1302	16064	4254.0
0.229[illegible]	263.1	131.[illegible]	0.2001	80.35	307.0	0.1500	13934	4579.0
0.2392	250.4	133.5	0.2407	55.06	309.7	0.2000	10294	51[illegible]2.0
0.2496	238.7	136.0	0.3001	37.17	312.4	0.2500	8242	56[illegible].0
0.2600	227.8	13[illegible].4	0.4094	24.17	315.5	0.3000	6793	6003.0
0.2714	215.4	141.0	0.5136	18.35	317.7	0.4010	4888	6594.0
0.2807	207.3	143.0	0.6507	14.36	319.8	0.5000	3742	7007.0
0.2901	196.5	145.5	0.7917	11.26	321.7	0.6000	2957	7340.0
0.3202	174.2	150.5	0.8938	9.68	322.8	0.6979	2377	7602.0
0.4013	132.3	162.9	1.0907	7.68	324.4	0.7979	1965	7818.0
0.5021	102.3	174.6	1.5938	5.07	327.6	0.9010	1657	8000.0
0.5997	80.62	183.4	2.0823	3.38	329.7	0.9978	141[illegible]	8149.0
0.6510	72.72	1[illegible]7.3	3.002	2.76	332.7	1.1072	1206	8292.0
0.7010	64.82	190.7	4.1958	2.02	335.5	1.5051	794.9	8674.0
0.7500	5[illegible].46	193.7	5.1701	1.5[illegible]	337.3	2.199[illegible]	468.7	9036.0
0.[illegible]010	54.21	196.5	5.4812	1.28	339.2	3.0023	332.0	9400.0
0.8510	51.41	199.2	7.5217	1.10	340.4	4.0006	246.3	9694.0
0.9010	45.87	201.6	9.0145	0.905	341.9	5.2240	1[illegible]3.2	9941.0
0.9510	42.00	203.8	12.0114	0.671	344.2	6.4923	143.3	10220.0
0.9990	39.23	205.7				7.4929	121.6	10282.0
1.1010	34.67	209.6				[illegible].4959	110.4	1039[illegible].0
1.4010	24.55	213.1				10.0041	92.35	10548.0
						11.97[illegible]	76.69	10712.0
1.9000	16.65	228.1						
2.3010	13.19	234.0						
2.[illegible]	10.35	241.0						
3.2031	9.41	244.0						
4.0062	7.63	250.8						
4.9698	6.02	257.3						
5.9835	5.02	262.9						
6.9953	4.22	267.5						
8.5093	3.46	273.3						
9.4937	3.11	276.5						
11.0010	2.66	280.8						
11.9750	2.46	283.3						

TABLE A.1 CONTINUED

Station 14			Station 20			Station 21		
Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)
0.0032	5328	0	0.0010	19185	0	0.0010	9500	0
0.0053	4393	10.11	0.0031	7663	27.86	0.0031	4389	15.38
0.0074	2449	17.17	0.0052	4169	40.11	0.0052	2520	21.51
0.0094	1573	19.22	0.0062	2596	43.59	0.0062	1564	23.65
0.0115	1096	23.35	0.0083	1831	48.16	0.0082	1172	27.57
0.0136	812.1	25.31	0.0103	1391	51.49	0.0103	864.0	29.66
0.0156	630.7	26.79	0.0124	1142	54.13	0.0154	596.6	32.23
0.0176	477.[illegible]	27.91	0.0145	977.6	56.29	0.0196	500.6	34.46
0.0207	370.8	28.21	0.0155	867.0	57.24	0.0237	482.1	36.49
0.0377	111.3	32.61	0.0176	791.7	58.96	0.0300	516.3	39.56
0.0467	76.0	33.42	0.0196	723.0	60.54	0.0352	623.0	42.49
0.0536	61.70	33.91	0.0248	618.6	64.00	0.0395	888.1	45.62
0.0616	50.35	34.35	0.0310	502.8	67.45	0.0416	1135	47.76
0.0706	42.26	34.77	0.0404	400.0	71.58	0.0426	1491	49.15
0.0826	35.09	35.23	0.0497	331.8	74.99	0.0447	2006	52.32
0.0965	29.17	35.63	0.0610	245.2	78.29	0.0468	2632	57.60
0.1126	24.31	36.12	0.0703	183.3	80.97	0.0489	3254	63.84
0.1326	20.70	36.57	0.0825	119.8	82.11	0.0500	4290	67.80
0.1844	14.20	37.46	0.0947	89.17	83.37	0.0552	13477	108.86
0.2193	11.67	37.91	0.1110	71.76	84.67	0.0594	18368	176.3
0.2623	9.79	38.38	0.1531	50.36	87.19	0.0646	19372	275.2
0.3134	7.60	38.82	0.2014	40.03	89.28	0.0667	19074	315.3
0.3767	6.12	39.25	0.2507	29.96	90.[illegible]	0.0698	17839	372.7
			0.2968	25.04	92.18	0.0750	15998	461.5
			0.3489	20.82	93.43	0.0792	15213	527.0
			0.4458	15.59	95.18	0.0375	13625	647.3
			0.5052	13.53	96.04	0.0953	12587	756.5
			0.6489	9.72	97.69	0.1031	11427	944.0
			0.7521	7.90	98.59	0.1469	7847	1257
			0.8416	6.75	99.25	0.2052	5636	1644
			1.0052	5.24	100.2	0.2552	4525	1896
			1.4959	2.93	102.1	0.3062	3729	2105
			2.0157	2.03	103.4	0.3937	2811	2389
			2.5774	1.54	104.4	0.5072	2065	2662
			3.0322	1.30	105.0	0.5958	1670	2825
			4.0113	0.967	106.1	0.6989	1335	2979
			5.5175	0.687	107.4	0.8520	1001	3156
			6.5019	0.572	108.0	1.0217	767.2	3305
			7.4935	0.489	108.5	1.5195	431.2	3589
			8.4351	0.432	109.0	2.061	289.5	3779
			9.4820	0.381	109.4	2.9890	190.6	3993
			10.9829	0.327	109.9	3.9847	142.6	4155
			11.9860	0.293	110.2	4.9355	109.2	4279
						5.9759	89.67	4378
						6.9885	74.10	4459
						7.5062	70.56	4498
						8.5010	65.75	4565
						9.4812	54.58	4626
						11.0042	48.22	4703
						12.5042	41.93	4776

TABLE A.1 CONTINUED

Station 22			Station 23			Station 24		
Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)
0.0021	9772	0	0.0031	2037	0	0.0225	154.7	0.2513
0.0041	3654	13.[illegible]6	0.0041	1093	1.56	0.024[illegible]	117.6	0.5359
0.0062	1976	19.66	0.0051	[illegible]	3.30	0.02[illegible]7	34.0	0.7[illegible]
0.0082	121[illegible]	22.93	0.0091	409.9	4.[illegible]	0.0329	29.[illegible]	1.0[illegible]
0.0093	950.0	23.97	0.0111	276.1	5.55	0.0371	20.70	1.17
0.0113	613.4	25.46	0.0140	192.5	6.25	0.0441	11.[illegible]	1.2[illegible]
0.0164	343.2	27.91	0.0209	104.3	7.22	0.05[illegible]9	5.9[illegible]	1.3
0.0194	264.2	28.83	0.0309	77.3	[illegible].12	0.0[illegible]3	3.[illegible]	1.44
0.0254	169.7	30.12	0.0413	[illegible]	8.91	0.0765	2.79	1.47
0.0294	131.5	30.73	0.0518	[illegible]2.2	9.74	0.0[illegible]	2.04	1.49
0.0422	66.93	31.95	0.0612	[illegible]1.2	10.51	0.0953	1.4[illegible]	1.50
0.0595	35.17	32.41	0.0725	71.1	11.3[illegible]	0.105[illegible]	1.03	1.52
0.0743	21.67	32.81	0.0853	48.3	12.16	0.1559	0.366	1.55
0.0999	10.10	33.63	0.1100	22.9[illegible]	12.[illegible]8	0.21[illegible]	0.256	1.57
0.1135	8.55	33.7[illegible]	0.1573	14.36	13.40	0.26[illegible]	0.19[illegible]	1.59
0.1405	6.22	34.0	0.2226	9.93	14.60	0.3176	0.153	1.59
0.1999	4.08	34.30	0.3497	6.11	15.58	0.4[illegible]63	0.120	[illegible].60
0.2539	3.17	34.48	0.5038	3.34	16.23	0.4650	0.10[illegible]	1.[illegible]
0.5061	1.39	35.00	0.6455	2.[illegible]	16.[illegible]			
0.9258	0.619	35.39	0.7028	2.10	17.19			
1.5016	0.326	35.64	0.9465	1.66	17.46			
2.5034	0.165	35.89	1.0039	1.53	17.55			
3.5302	0.129	36.04	1.5060	0.[illegible]51	1[illegible].12			
4.5060	0.100	36.16	1.9933	0.597	1[illegible].46			
			2.4359	0.457	1[illegible].72			
			2.9796	0.392	1[illegible].93			
			3.4316	0.329	19.11			
			3.9847	0.2[illegible]1	19.26			
			4.4929	0.249	19.40			
			4.9903	0.225	19.52			
			5.4661	0.207	19.62			
			5.9813	0.1[illegible]8	19.72			
			[illegible].4393	0.172	19.[illegible]1			
			6.9[illegible]02	0.1[illegible]	19.[illegible]9			
			7.4[illegible]11	0.143	19.97			
			7.9721	0.133	20.04			
			[illegible].4810	0.126	20.10			
			8.9351	0.119	20.17			
			9.4976	0.114	20.2[illegible]			
			10.0079	0.107	20.28			
			10.5293	0.103	20.34			

SECRET

TABLE A.3 CONTINUED

Station 30			Station 31			Station 32		
Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)
[illegible].0030	[illegible]1.5	1.97	0.0050	230.4	0.[illegible]52	0.0213	16.23	0
0.0060	360.[illegible]	3.44	0.00[illegible]	134.4	1.70	0.0422	12.75	0.302
0.00[illegible]	[illegible]	4.34	0.0125	[illegible]	2.11	0.0530	9.[illegible]0	0.537
0.011[illegible]	[illegible]	4.92	0.01[illegible]	46.46	2.50	0.0734	7.56	0.627
0.01[illegible]7	203.1	5.55	0.0301	30.30	2.94	0.0942	6.15	0.700
0.021[illegible]	76.92	5.92	0.0439	32.15	3.37	0.1463	3.29	1.01
0.0274	59.72	6.29	0.0552	45.62	3.[illegible]1	0.2074	2.15	1.15
0.0354	49.20	[illegible]	0.0632	64.2[illegible]	4.24	0.2504	1.71	1.25
0.0446	45.29	7.2[illegible]	0.069[illegible]	[illegible]6.12	4.67	0.3025	1.33	1.33
0.0530	47.[illegible]	7.55	0.0755	13[illegible].5	5.52	0.4066	0.957	1.45
0.0616	55.14	[illegible].0	0.0[illegible]32	240.2	6.[illegible]2	0.5004	0.[illegible]06	1.53
0.0[illegible]2	65.65	[illegible].40	0.0854	339.0	7.46	0.6902	0.5[illegible]3	1.67
0.0747	79.93	[illegible].96	0.0[illegible]	460.5	[illegible].74	0.[illegible]752	0.400	1.75
0.0[illegible]92	99.52	[illegible]	0.0907	629.0	9.91	0.9793	0.292	1.79
0.0[illegible]24	11[illegible].0	9.72	0.0929	1001	11.65	1.1665	0.177	1.[illegible]
0.0867	126.0	10.33	0.0939	1675	13.10	1.2809	0.147	1.[illegible]5
0.0[illegible]	121.[illegible]	10.62	0.0966	201[illegible]	16.97	1.457[illegible]	0.115	1.[illegible]7
0.092[illegible]	109.5	10.97	0.1013	2127	2[illegible].10	1.5[illegible]27	0.102	1.[illegible]
0.1027	73.15	11.[illegible]	0.1106	1[illegible]59	46.60			
0.1175	45.33	12.72	0.1210	1643	64.75			
0.1326	34.0[illegible]	13.54	0.1304	1502	79.42			
0.1619	2[illegible].35	14.26	0.139[illegible]	140[illegible]	93.04			
0.1[illegible]17	24.7[illegible]	14.79	0.1512	1298	108.5			
0.2015	22.[illegible]6	15.26	0.1793	1092	141.9			
0.2494	1[illegible].09	16.23	0.2012	972.[illegible]	164.3			
0.3004	14.[illegible]	17.0[illegible]	0.2512	772.6	207.4			
0.4046	10.64	1[illegible].40	0.3001	637.0	241.7			
0.5462	7.41	19.67	0.4000	460.[illegible]	296.0			
0.6452	5.9[illegible]	20.33	0.5031	34[illegible].4	337.[illegible]			
0.8077	4.37	21.16	0.6040	274.8	36[illegible].7			
0.9004	3.74	21.54	0.7019	222.7	[illegible]			
1.1016	3.13	21.93	0.8049	132.4	413.7			
1.3108	2.21	22.69	0.9027	154.6	430.0			
1.7149	1.67	23.48	1.5025	122.8	450.7			
2.5055	1.01	24.50	1.5092	72.14	493.0			
3.3596	0.721	25.23	1.9888	50.03	522.1			
4.4627	0.523	25.94	2.4428	35.62	547.7			
5.4501	0.413	26.36	3.0012	28.64	565.5			
6.4855	0.336	26.74	4.0272	20.37	590.5			
7.4427	0.286	27.04	5.0355	16.50	609.2			
8.4051	0.249	27.29	7.0209	11.50	636.3			
9.5009	0.220	27.55	9.9963	8.09	670.3			
10.9800	0.188	27.85	11.174	7.16	673.1			
12.0018	0.170	28.03						

TABLE A.1 CONTINUED

Station 33			34		
Time (hr)	Dose Rate (r/hr)	Dose (r)	Time (hr)	Dose Rate (r/hr)	Dose (r)
0.0021	65.1[illegible]	0	0.0197	327.[illegible]	10.32
0.0042	39.0	0.17[illegible]	0.0413	1[illegible]1.6	15.56
0.0062	2[illegible].45	0.247	0.0652	113.[illegible]	[illegible]
0.007[illegible]	23.45	0.274	0.0672	109.4	[illegible]
0.009[illegible]	19.1[illegible]	0.31	0.0714	95.2	[illegible]
0.014[illegible]	10.70	0.393	0.0797	67.13	20.05
0.019	7.01	0.439	0.0954	36.47	20.74
[illegible]	5.01	0.470	0.1266	14.55	21.54
[illegible]	3.[illegible]	0.499	0.1464	10.74	21.7[illegible]
0.0399	2.[illegible]	0.526	0.1620	9.09	21.[illegible]
0.0489	2.44	0.551	0.20[illegible]	6.52	22.2[illegible]
0.0593	2.33	0.579	0.2516	5.00	22.54
0.070	[illegible].42	0.603	0.2905	4.02	22.73
0.0[illegible]54	2.[illegible]	0.641	0.3776	3.03	23.02
0.1000	2.07	0.675	0.5200	2.00	23.37
0.1301	1.92	0.767	0.6401	1.51	23.5[illegible]
[illegible]	1.[illegible]	0.797	0.[illegible]296	1.04	23.[illegible]2
0.199	0.70[illegible]	0.[illegible]42	0.9[illegible]00	0.[illegible]01	23.9[illegible]
0.259	0.533	0.[illegible]72	1.42[illegible]	0.504	24.23
0.3497	0.370	0.915	1.9190	0.350	24.43
0.4[illegible]4	0.242	0.95[illegible]	2.2252	0.301	24.53
0.5942	0.191	0.970	3.3427	0.201	24.79
0.[illegible]959	0.154	0.99	4.59[illegible]	0.132	24.99
0.[illegible]034	0.125	1.01	5.7[illegible]	0.105	25.12
0.9072	0.107	1.02			

APPENDIX B

DEVELOPMENT OF BASIC FALLOUT SAMPLE COLLECTOR

The successful collection of fallout requires initial capture of the falling material, retention during the post-shot meteorological environment, and easy removal for analysis. Previously developed collectors have relied on inserts (such as hexcel) or sticky surfaces in the trays to create particle traps or dead-air spaces to contain fine particles. Past collections have shown losses by large particles bouncing out and difficulty in processing particles imbedded in a sticky-surface coating. Some difficulty has also been experienced with shredding or disintegration of certain types of inserts.

The approach used in developing the present basic collector was to develop a better tray insert that could most effectively trap and retain the falling particles and from which the fallout could be easily removed for physical and chemical analyses. The fallout material expected from a land-surface nuclear detonation is a dry, granular particulate, so emphasis was placed on capture and retention of this material.

The experimental proof-testing setup shown in Figure B.1 was built at Camp Parks, California. Measured amounts

of coarse sand in different size ranges was ejected from a sandblasting nozzle at an angle of 66° to the vertical to impinge on various collector configurations at an angle and speed which simulated the arrival of fallout. This angle applies to a range of conditions from 80-micron particles in a 1-knot wind to 800-micron particles in a 16-knot wind. Several collector insert geometries and orientations were used with different particle sizes to establish the most efficient collector configuration. Table B.1 summarizes the test conditions and the results obtained.

Using the best collector from the above tests, further tests were made using a straight drop of 30 feet where the material dropped was restrained by a 2-inch-diameter pipe for the first 20 feet to insure that most of it hit the collector. The results of these tests, also summarized in Table B.1, show generally higher retention in all collector configurations, but similar relative retentions.

The best basic collector was ultimately used during NRDL participation in Shots Small Boy, Johnie Boy and Sedan at NTS (Figure 2.2). It consisted of a #16 gage aluminum pan 24 inches square and 2 inches deep with an insert of 2-inch-wide x 23-7/8-inch-long bare aluminum venetian blind louvers. They were mounted on 1-1/4-inch centers in two

parallel notched aluminum retainer bars at a 45-degree angle to the vertical. The concave surface of the louvers faced upward, and the most efficient collection of material was achieved when they sloped or opened toward the direction from which the material came. In the field, they opened into the direction of the expected wind.

The collector trays, covers and inserts were given a perchloroethylene degreasing treatment prior to being closed and shipped to the field. This removed any grease that might cause the dry fallout to adhere. Collected fallout was easily removed by tapping or brushing the louver insert, or by disassembling the insert and brushing the individual louvers. The dry particulate fallout collected in Nevada showed little tendency to adhere to the bare aluminum, so that disassembly of the insert usually proved unnecessary.

TABLE B.1 RESULTS OF BASIC-COLLECTOR EVALUATION FOR PARTICLES FALLING AT 66° FROM THE VERTICAL AND VERTICALLY

Insert Configuration	Collector Orientation	Material Size (μ)	Material Retained (%)
	66° From Vertical		
Louvers, 1-1/4" centers at 45°	Open Upwind	700-1190	98.9
" "	Open Crosswind	700-1190	96.8
" "	Open Downwind	700-1190	91.9
" "	Open Upwind	500- 700	98.2
" "	Open Crosswind	500- 700	96.6
" "	Open Downwind	500- 700	57.8
" "	Open Upwind	350- 700	91.6
" "	Open Crosswind	350- 700	91.6
" "	Open Downwind	350- 700	85.8
" "	Open Upwind	1190-2000	98.4
" "	Open Downwind	1190-2000	98.4
Fiberglass Filter 24" x 24"	-	700-1190	83.0
3/8 " Al Hexcel	-	700-1190	82.0
Bare Tray 4" Deep	-	700-1190	85.0
Tray w/1 mil polyethylene liner	-	700-1190	76.4
Bare Tray, 2" Deep	-	700-1190	62.8
" " " "	-	500- 700	58.6
" " " "	-	350- 700	67.9
" " " "	-	1190-2000	70.5
	Vertically		
Louvers, 1-1/4" centers at 45°	-	700-1190	98.5
3/8" Al Hexcel	-	700-1190	97.0
Bare Tray 2" Deep	-	700-1190	91.4

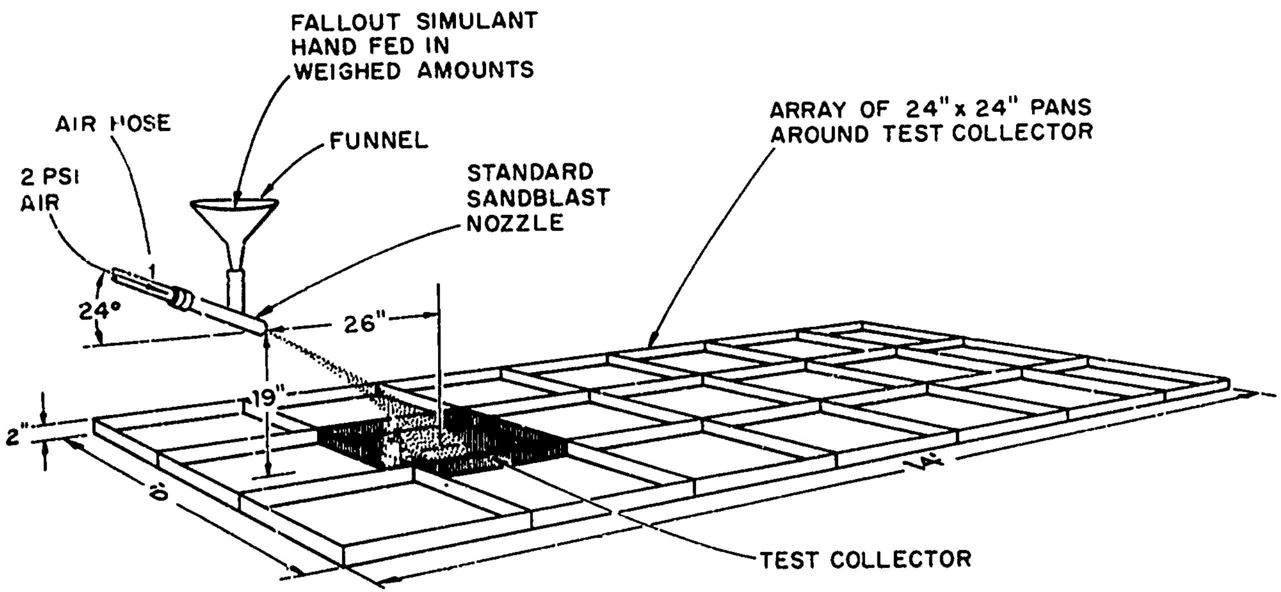


Figure B.1 Experimental setup for proof-testing of basic fallout collector.

APPENDIX C

TREATMENT OF SAMPLES RETURNED TO NRDL

Sample No.		Radiochemical Analyses[a]	
		Complete[b]	Partial[c]
01-A07	+ 1/4		x
01-A07	+ 7	x	
01-A07	+ 12		x
01-A07	+ 24		x
01-A07	+ 42		x
01-A07	+ 80		x
01-A07	+ 170		x
01-A07	+ 250	x	
01-A07	+ 325		x
01-A07	Pan	x	
01-A08	Gross		
02-A02	+ 1/4	x	
02-A02	+ 7		x
02-A02	+ 12		x
02-A02	+ 24		x
02-A02	+ 42		x
02-A02	+ 80		x
02-A02	+ 170		x
02-A02	+ 250		x
02-A02	+ 325		x
02-A02	Pan	x	
245 Right	Cloud	Particle Studies	
245 Left	Cloud	Particle Studies	
20-A04	+ 7 Combd.		x
20-A04	+ 24 for		x
20-A04	· 42 Anal.		x
20-A04	+ 12	x	
20-A04	+ 80	x	
20-A04	+ 170		x
20-A04	+ 325		x
20-A04	Pan	x	
20-A07	+ 7		x
20-A07	+ 12	x	

SECRET

Sample No.		Radiochemical Analyses[a]	
		Complete[b]	Partial[c]
20-A07	+ 24		x
20-A07	+ 42		x
20-A07	+ 80	x	
20-A07	+ 170		x
20-A07	+ 325		x
20-A07	Pan	x	
11-A07	1	Decay	
11-A07	2	Particle Study	
11-A07	3	Particle Study	
11-A07	4 Gross		x
11-A07	5		Decay
11-A07	6 Samples	Particle Study	
11-A07	7	Particle Study	
21-A03	1		
21-A03	2 Identical		
21-A03	3	Decay	
21-A03	4 Gross		
21-A03	5		x
21-A03	6 Samples	Decay	
21-A03	7		
21-A04	1		
21-A04	2 Identical	Decay	
21-A04	3		
21-A04	4 Gross		x
21-A04	5 Samples	Decay	
21-A04	6		
13-A03	Gross		x
13-A04	Gross		x
23-A03	Gross		x
23-A03	Gross		x
23-A04	Gross		x
31-A03	Gross		x
827-L2	Cloud	x	
842-R11	Cloud	x	

Notes: (a) Duplicate analyses were made on all samples.
(b) Complete Radiochemistry: Sr^{89}, Sr^{90}, Y^{91}, Zr^{95}, Mo^{99}, Ru^{103}, Ru^{106}, Te^{131}, I^{131}, Te^{132}, Cs^{136}, Cs^{137}, Ba^{140}, Ce^{141}, Ce^{144}, Pu^{239}. Also, W^{185}, W^{187}, (Np^{239}) on shipments of 7/20/62 and 7/31/62 .
(c) Partial Radiochemistry: Sr^{89}, Sr^{90}, Zr^{95}.

APPENDIX D

BASIC RADIATION MEASUREMENTS

Tables D.1A, D.1B, D.2A, and D.2B present uncorrected sample radiation measurements and corresponding time, background radiation, and radiation standard measurements required to correct them for comparison and analysis. These are the raw data manipulated by the NRDL IBM 704 computer to generate Tables 3.3, 3.4, 3.5 and 3.6.

Tables D.1A and D.1B are scintillation-counter measurements for basic data and decay corrections of basic data respectively. The sample number 01A01 identifies the station number (01), an always-open collector (AO), and collector in Number 1 position as described in Section 2.3.1. "E" indicates the residual reading after the fall-out has been removed from the collector. Age is given in thousandths of a day after shot time and "CH-NO" identifies the particular one of 3 available cathouse counters used.

The original intent of the collimator was to attenuate the sample radiation intensity in a consistent manner to provide high-and low-range measurements, extending the usefulness of the counter. No consistent high-range measurements using the collimator could be made. Data

analysis has been limited to using counts with the same coincidence correction used on Shot Small Boy data between 10^6 counts/min and 4×10^6 counts/min, the upper limit of the scintillation counter. Background is to be subtracted from the raw counts and "STD" shows c/m response to a radium source used to calibrate the instrument.

Tables D.2A and D.2B are 4-pi ionization-chamber measurements for basic data and decay corrections of basic data, respectively. The sample numbers are the same as for the scintillation counter except that some of the samples are combined from several collectors as indicated. The sieve mesh numbers given have openings in microns as follows:

Mesh	Microns
7	2830
12	1410
24	710
42	350
80	177
115	124
170	88
250	61
325	44

500 mesh indicates minus-325-mesh material retained in the pan, and "W" means material was wet-sieved. The size of minus-325-mesh material, classified by a water-column settling technique, is given in microns. Weights given are the amount of the total sample retained on the stated sieve size and one two-hundredth of total weight less than stated micron size for the settling-column analyses.

Columns four and five give age in days after shot and the reading in milliamps of the sample. Columns six and seven give age and reading of gross water-column samples before they were centrifuged. The background should be subtracted from all gross readings and the standard is used to correct all readings for changes in instrument sensitivity. Ideally, the standard should read 670×10^{-9}.

TABLE D.1A UNCORRECTED SCINTILLATION COUNTER RADIATION MEASUREMENTS (DATA)

SAMPLE NUMBER	EVENT	AGE (DAYS)	CH NO	COLLIMATOR OUT (C/M)	COLLIMATOR OUT (C/M)	COLLIMATOR IN (C/M)	COLLIMATOR IN (C/M)	BKG (C/M)	STD (C/M)
01 AO 1	JB	4.025	2	730335	731728	15186	15210	1179	31035
01 AO 2	JB	0.492	3	2492893	2495411	168210	166836	263	34228
01 AO 2	JB E	0.572	2	52918	52559			690	31206
01 AO 3	JB	0.455	3	2178456	2179848	100230	99848	369	34228
01 AO 3	JB E	0.480	3	94391	93953			354	34228
01 AO 4	JB	0.464	3	1538734	1538460	68363	68719	294	34228
01 AO 5	JB	0.475	3	1700100	1696795	75506	75486	354	34228
01 AO 6	JB	0.461	3	2714355	2728472	209974	208530	294	34228
01 AO 7	JB	0.481	3	2531482	2538937	105977	106366	354	34228
01 AO 7	JB E	0.576	2	60548	60957			690	31206
01 AO 8	JB	0.497	3	5174573	5196261	486454	486258	475	34228
01 AO 8	JB E	0.574	2	46278	46883			690	31206
01 AO 9	JB	0.449	3	761331	891096	24795	24913	369	34228
02 AO 1	JB	0.430	3	302900	302700			310	34228
02 AO 2	JB	0.429	3	296400	296400			310	34228
02 AO 3	JB	0.437	3	149200	147072			360	34228
02 AO 4	JB	0.438	3	231972	230971			360	34228
02 AO 5	JB	0.433	3	286400	285500			360	34228
02 AO 6	JB	0.435	3	224200	224600			360	34228
02 AO 7	JB	4.021	2	4837	5041			1179	31035
02 AO 8	JB	0.436	3	240900	239500			360	34228
02 AO 9	JB	0.441	3	149763	148827			334	34228
11 AO 1	JB	86.173	3	1212216	1213152	34067	33774	593	34204
11 AO 1	JB	91.064	3	1185738	1186282	18096		130	34204
11 AO 1	JB	170.000	3	564296	565513			3815	33100
11 AO 2	JB	91.083	3	1163235		32750		130	34204
11 AO 2	JB E	91.093	3	780				130	34204
11 AO 3	JB	91.086	3	1348301		37754		130	34204
11 AO 5	JB	91.087	3	1753803		60753		130	34204
11 AO 7	JB	7.511	2	4930792	4958803	603276	602376	2096	32132
12 AO 1	JB	0.434	2	34179	33273			500	31206
12 AO 2	JB	0.437	2	35130	34958			500	31206
12 AO 3	JB	0.440	2	34910	34808			500	31206
12 AO 4	JB	4.024	2	4399	4455			1179	31035
12 AO 5	JB	0.444	2	33009	33099			500	31206
12 AO 6	JB	0.447	2	46579	46676			500	31206
12 AO 7	JB	0.448	2	36272	36160			546	31206
12 AO 8	JB	0.451	2	435520	435612	23151	23279	546	31206
12 AO 9	JB	0.461	2	54860	55527			689	31206
13 AO 1	JB	7.529	2	2137	2162			1697	32846
14 AO 2	JB	0.421	3	3477	3455			320	34228
14 AO 3	JB	0.394	2	3859	3869			451	30946
14 AO 4	JB	0.410	3	3767	3648			304	34228
14 AO 5	JB	0.417	3	3362	3452			304	34228
14 AO 6	JB	0.408	3	3544	3577			304	34228
14 AO 7	JB	0.413	3	3505	3412			304	34228
14 AO 8	JB	0.427	3	3279	3442			310	34228
14 AO 9	JB	0.414	3	3428	3383			304	34228
20 AO 1	JB	0.401	2	15183	15284			451	30946
20 AO 2	JB	0.512	3	21199	20849			386	34228
20 AO 3	JB	0.523	3	10485	10359			420	34228
20 AO 4	JB	0.520	3	265970	266245			420	34228
20 AO 5	JB	0.517	3	20248	20067			414	34228
20 AO 6	JB	0.515	3	17819	17668			414	34228
20 AO 7	JB	0.510	3	194214	194340			386	34228
20 AO 8	JB	0.505	3	14014	13934			291	34228
20 AO 9	JB	0.503	3	149444	149064			291	34228

TABLE D.1A UNCORRECTED SCINTILLATION COUNTER RADIATION MEASUREMENTS (DATA)

SAMPLE NUMBER	EVENT	AGE (DAYS)	CH NO	COLLIMATOR OUT (C/M)	(C/M)	COLLIMATOR IN (C/M)	(C/M)	BKG (C/M)	STD (C/M)
21 AO 1	JB	86.184	3	742641	744190			450	34204
21 AO 2	JB	7.531	2	3907578	3909997	206047	205966	1697	32846
21 AO 3	JB	8.401	3	4409703	4434423			478	34228
21 AO 4	JB	8.378	3	[illegible]	4467643	182831		499	34228
21 AO 4	JB E	8.482	3	21410	21459			492	34228
22 AO 1	JB	0.398	2	1381	1327			451	30946
22 AO 2	JB	0.432	2	1281	1241			525	30946
22 AO 3	JB	0.430	2	1298	1293			525	30946
22 AO 4	JB	0.427	2	1261	1264			478	30946
22 AO 5	JB	0.403	2	1291	1261			451	30946
22 AO 6	JB	0.402	2	1298	1240			451	30946
22 AO 7	JB	0.426	2	1392	1344			478	30946
22 AO 8	JB	0.422	2	1331	1201			478	30946
22 AO 9	JB	0.419	2	1343	1316			451	30946
23 AO 1	JB	9.490	2	855				309	32439
23 AO 6	JB	9.486	2	846	868			63	32439
23 AO 7	JB	9.488	2	908	1092			125	32439
23 AO 9	JB	9.489	2	919	891			309	32439
30 AO 1	JB	4.010	2	4007	3891			1179	31035
30 AO 2	JB	0.463	2	11794	11685			689	31206
30 AO 3	JB	0.468	2	101548	101190	262	249	190	31206
30 AO 4	JB	0.472	2	28042	28153			695	31206
30 AO 5	JB	0.474	2	90714	89445			695	31206
30 AO 6	JB	0.477	2	148410	149137			695	31206
30 AO 7	JB	0.478	2	4643	4784			695	31206
30 AO 8	JB	0.481	2	29959	29891			695	31206
30 AO 9	JB	0.482	2	20729	20305			695	31206
31 AO 1	JB	7.535	2	1428592	1427755			1697	32846
31 AO 2	JB	9.500	2	1079757	1079654	16306	15895	738	32439
31 AO 2	JB E	9.550	2	8972	8923			869	33123
31 AO 3	JB	8.428	3	1287773	1290301	18745	18716	478	34228
31 AO 3	JB E	8.479	3	12430	12228			492	34228
31 AO 4	JB	8.388	3	1369217	1370197	20710	20729	739	34228
31 AO 4	JB E	8.469	3	11399	11371			493	34228
31 AO 5	JB	9.517	2	1184128	1185049	34063	33771	825	33123
31 AO 5	JB E	9.536	2	7999	8152			795	33123
31 AO 6	JB	9.527	2	1079500	1081274	16792	16601	825	33123
31 AO 6	JB E	9.535	2	6075	6259			795	33123
31 AO 7	JB	9.510	2	1082027	1082516	21356	21322	738	32439
31 AO 7	JB E	9.538	2	10468	10256			795	33123
31 AO 8	JB	9.507	2	1125723	1126415	24828	24484	738	32439
31 AO 8	JB E	9.540	2	6357	6323			795	33123
31 AO 9	JB	9.503	2	1092630	1094527	26207	26182	738	32439
31 AO 9	JB E	9.549	2	7380	7856			869	33123
32 AO 1	JB	0.492	2	1303	1342			549	31206
32 AO 2	JB	0.492	2	4037	2419			545	31206
32 AO 3	JB	0.499	2	2383	2322			723	31206

TABLE D.18 UNCORRECTED SCINTILLATION COUNTER RADIATION MEASUREMENTS (DECAY)

SAMPLE NUMBER	EVENT	AGE (DAYS)	CH NO	COLLIMATOR OUT (C/M)	COLLIMATOR OUT (C/M)	COLLIMATOR IN (C/M)	COLLIMATOR IN (C/M)	BKG (C/M)	STD (C/M)
01 AO 1	JB	0.474	3	4281935	4280342	370093	371185	323	34228
01 AO 1	JB	1.029	2	2597287	2592778	317297	321332	367	31035
01 AO 1	JB	2.164	2	1639000	1539000	45200	45609	600	31035
01 AO 1	JB	3.034	2	1105686	1108593	25708	25578	589	31035
01 AO 1	JB	4.025	2	730335	73172[illegible]	15186	15210	1179	31035
01 AO 1	JB	7.332	2	316785	317908			958	32132
01 AO 1	JB	8.356	2	264873	266719			992	32457
01 AO 1	JB	8.640	2	272130	270224			880	32876
01 AO 1	JB	9.215	2	242904	242259			712	33216
01 AO 1	JB	10.018	2	220756	221772			1638	33500
01 AO 1	JB	12.08[illegible]	2	177713	178272			682	33106
01 AO 1	JB	13.263	3	152911	152348			673	33250
01 AO 1	JB	14.046	2	127685	127824			935	33511
01 AO 1	JB	15.177	2	127862	127708			769	33511
01 AO 1	JB	43.950		42008				353	33792
01 AO 1	JB	86.179	3	24461	24513	1037	1070	450	34204
01 AO 1	JB	170.000	3	13330	13519			3815	33100
02 AO 7	JB	0.396	2	183406	183005			451	30946
02 AO 7	JB	1.045	2	21383	21251			588	31035
02 AO 7	JB	2.163	2	7966				600	31035
02 AO 7	JB	3.039	2	4925	4831			589	31035
02 AO 7	JB	4.021	2	4837	5041			1179	31035
02 AO 7	JB	7.329	2	2487	2425			958	32132
12 AO 4	JB	0.400	2	58332	57983			451	30946
12 AO 4	JB	1.036	2	12607	12515			367	31035
12 AO 4	JB	2.159	2	6166				600	31035
12 AO 4	JB	3.042	2	3990	4027			589	31035
12 AO 4	JB	4.024	2	4399	4455			1179	31035
12 AO 4	JB	7.326	2	2461	2428			958	32132
30 AO 1	JB	0.399	2	15929	15896			451	30946
30 AO 1	JB	1.040	2	7553	7439			588	31035
30 AO 1	JB	2.157	2	4244				600	31035
30 AO 1	JB	3.041	2	2833	2798			589	31035
30 AO 1	JB	4.010	2	4007	3891			1179	31035
30 AO 1	JB	7.334	2	2394	2384			958	32132
31 AO 1	JB	7.535	2	1428592	1427755			1697	32846
31 AO 1	JB	8.370	2	1239504	1239322			992	32457
31 AO 1	JB	8.637	2	1248812	1247653	15810	15870	880	32876
31 AO 1	JB	9.205	2	1191399	1194004	26621	26166	712	33216
31 AO 1	JB	10.021	2	986177	989137	9450		1638	33500
31 AO 1	JB	12.083	2	854373	855168	19147	19198	682	33106
31 AO 1	JB	13.265	3	732670	732558	10931	11112	673	33250
31 AO 1	JB	14.049	2	626479	627504	9380	9445	935	33511
31 AO 1	JB	15.179	2	609291	608449	15924	16049	769	33511
31 AO 1	JB	15.184	2	576235	578712	7875	7954	769	33511
31 AO 1	JB	15.187	2	616380	615311	6527	6452	769	33511
31 AO 1	JB	15.190	2	618380	615040	18343		769	33511
31 AO 1	JB	43.978		181148				353	33792
31 AO 1	JB	86.188	3	95389	95150	1871	1847	450	34204
31 AO 1	JB	170.000	3	43713	43776			3815	33100

TABLE D.2A UNCORRECTD 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DATA)+

SAMPLE NUMBER	SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01 AO 2	7	1.8	4.052	230E- 9			40E-11	670E- 9	J1
01 AO 2	12	1.9	4.052	560E- 9			40E-11	670E- 9	J1
01 AO 2	24	2.8	4.052	425E- 9			40E-11	670E- 9	J1
01 AO 2	42	2.6	4.052	222E- 9			40E-11	670E- 9	J1
01 AO 2	80	3.4	4.052	960E-10			40E-11	670E- 9	J1
01 AO 2	170	4.9	4.053	540E-10			40E-11	670E- 9	J1
01 AO 2	250	2.1	4.054	200E-10			40E-11	670E- 9	J1
01 AO 2	325	1.6	4.054	170E-10			40E-11	670E- 9	J1
01 AO 2	500	1.7	4.055	280E-10			40E-11	670E- 9	J1
01 AO 3	7	4.75	0.510	112E- 7			40E-11	665E- 9	J1
01 AO 3	12	3.05	0.510	125E- 7			40E-11	665E- 9	J1
01 AO 3	24	4.25	0.510	500E- 8			40E-11	665E- 9	J1
01 AO 3	80	10.40	0.510	560E- 8			40E-11	665E- 9	J1
01 AO 3	170	7.35	0.510	140E- 8			40E-11	665E- 9	J1
01 AO 3	325	4.00	0.510	520E- 9			40E-11	665E- 9	J1
01 AO 3	500	3.00	0.510	520E- 9			40E-11	665E- 9	J1
01 A04-5	7W	21.7	1.218	116E- 7			40E-11	665E- 9	J1
01 A04-5	12W	8.9	1.218	622E- 8			40E-11	665E- 9	J1
01 A04-5	24W	9.4	1.218	420E- 8			40E-11	665E- 9	J1
01 A04-5	42W	8.6	1.220	222E- 8			40E-11	665E- 9	J1
01 A04-5	80W	12.5	1.221	225E- 8			40E-11	665E- 9	J1
01 A04-5	115W	10.2	1.221	225E- 8			40E-11	665E- 9	J1
01 A04-5	170W	8.9	1.221	100E- 8			40E-11	665E- 9	J1
01 A04-5	250W	6.7	1.222	725E- 9			40E-11	665E- 9	J1
01 A04-5	325W	4.7	1.223	558E- 9			40E-11	665E- 9	J1
01 A04-5	40W	0.0318	2.846	175E-11	1.224	682E-11	40E-11	665E- 9	J1
01 A04-5	30W	0.0271	2.846	158E-11	1.225	610E-11	40E-11	665E- 9	J1
01 A04-5	20W	0.0244	2.846	142E-11	1.229	485E-11	40E-11	665E- 9	J1
01 A04-5	10W	0.0136	2.847	112E-11	1.230	325E-11	40E-11	665E- 9	J1
01 A04-5	5W	0.0101	2.847	80E-11	1.232	255E-11	40E-11	665E- 9	J1
01 A04-5	3W	0.0062	2.848	75E-11	1.237	180E-11	40E-11	665E- 9	J1
01 A04-5	1W	0.0027	2.848	60E-11	2.024	75E-11	40E-11	665E- 9	J1
02 A04-6-8	4W	7.79	1.302	825E-10			50E-11	668E- 9	J1
02 A04-6-8	7W	2.20	1.302	590E- 9			50E-11	668E- 9	J1
02 A04-6-8	12W	3.72	1.303	505E- 9			50E-11	668E- 9	J1
02 A04-6-8	24W	4.90	1.303	465E- 9			50E-11	668E- 9	J1
02 A04-6-8	42W	4.81	1.304	240E- 9			50E-11	668E- 9	J1
02 A04-6-8	80W	8.86	1.305	225E- 9			50E-11	668E- 9	J1
02 A04-6-8	115W	7.75	1.305	130E- 9			50E-11	668E- 9	J1
02 A04-6-8	170W	6.70	1.306	945E-10			50E-11	668E- 9	J1
02 A04-6-8	250W	5.38	1.308	765E-10			50E-11	668E- 9	J1
02 A04-6-8	325W	4.31	1.309	608E-10			50E-11	668E- 9	J1
02 A04-6-8	40W	0.0422	2.860	80E-11	1.309	185E-11	40E-11	670E- 9	J1
02 A04-6-8	30W	0.0380	2.861	70E-11	1.310	180E-11	40E-11	670E- 9	J1
02 A04-6-8	20W	0.0220	2.862	65E-11	1.311	160E-11	40E-11	670E- 9	J1
02 A04-6-8	10W	0.0133	2.863	58E-11	1.312	135E-11	40E-11	670E- 9	J1
02 A04-6-8	5W	0.0092	2.864	50E-11	1.312	50E-11	40E-11	670E- 9	J1
02 A04-6-8	1W	0.0040	2.865	50E-11	1.313	50E-11	50E-11	668E- 9	J1

TABLE D.2A UNCORRECTD 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DATA)*

SAMPLE NUMBER	SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
12 A0789	7W	1.15	1.295	230E- 9			40E-11	668E- 9	J1
12 A0789	12W	1.85	1.296	740E- 9			40E-11	668E- 9	J1
12 A0789	24W	2.35	1.297	250E- 9			40E-11	668E- 9	J1
12 A0789	42W	1.95	1.298	238E- 9			40E-11	668E- 9	J1
12 A0789	80W	2.88	1.299	892E-10			40E-11	668E- 9	J1
12 A0789	115W	2.00	1.300	327E-10			40E-11	668E- 9	J1
12 A0789	170W	1.65	1.301	235E-10			40E-11	668E- 9	J1
12 A0789	250W	1.28	1.302	180E-10			40E-11	668E- 9	J1
12 A0789	325W	1.08	1.302	168E-10			40E-11	668E- 9	J1
12 A0789	40W	0.0148	2.855	50E-11	1.303	60E-11	40E-11	668E- 9	J1
12 A0789	20W	0.0083	2.856	50E-11	1.304	60E-11	40E-11	670E- 9	J1
12 A0789	10W	0.0063	2.85	45E-11	1.304	40E-11	40E-[illegible]	670E- 9	J1
12 A0789	5W	0.0042	2.857	40E-11	1.304	40E-11	40E-11	670E- 9	J1
12 A0789	3W	0.0025	2.857	40E-11	1.304	40E-11	40E-11	670E- 9	J1
12 A0789	1W	0.0006	2.857	40E-11	1.304	40E-11	40E-11	670E- 9	J1
20 A0 4	7	0.5	2.385	178E- 8			40E-11	670E- 9	J1
20 A0 4	12	0.25	2.385	165E-10			40E-11	670E- 9	J1
20 A0 4	24	0.20	2.386	395E-10			40E-11	670E- 9	J1
20 A0 4	42	0.13	2.386	258E-10			40E-11	670E- 9	J1
20 A0 4	80	0.20	2.387	205E-10			40E-11	670E- 9	J1
20 A0 4	170	0.68	2.387	150E-10			40E-11	670E- 9	J1
20 A0 4	325	1.92	2.388	95E-10			40E-11	670E- 9	J1
20 A0 4	500	1.50	2.388	58E-10			40E-11	670E- 9	J1
20 A0 7	7	2.65	2.406	535E- 9			40E-11	670E- 9	J1
20 A0 7	12	1.59	2.406	150E- 9			40E-11	670E- 9	J1
20 A0 7	24	1.66	2.407	220E- 9			40E-11	670E- 9	J1
20 A0 7	42	1.71	2.407	131E- 9			40E-11	670E- 9	J1
20 A0 7	80	1.70	2.408	180E- 9			40E-11	670E- 9	J1
20 A0 7	170	1.69	2.408	160E- 9			40E-11	670E- 9	J1
20 A0 7	325	2.82	2.409	105E- 9			40E-11	670E- 9	J1
20 A0 7	500	3.13	2.409	98E- 9			40E-11	670E- 9	J1
21 A0 1	7		2.969	415E- 9			40E-11	670E- 9	J1
21 A0 1	12		2.969	960E- 9			40E-11	670E- 9	J1
21 A0 1	24		2.969	732E- 9			40E-11	670E- 9	J1
21 A0 1	42		2.969	385E- 9			40E-11	670E- 9	J1
21 A0 1	80		2.970	168E- 9			40E-11	670E- 9	J1
21 A0 1	170		2.970	95E- 9			40E-11	670E- 9	J1
21 A0 1	250		2.970	348E-10			40E-11	670E- 9	J1
21 A0 1	325		2.971	292E-10			40E-11	670E- 9	J1
21 A0 1	500		2.971	475E-10			40E-11	670E- 9	J1

TABLE D.2A UNCORRECTD 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DATA)+

SAMPLE NUMBER	SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
30 A02-8	7W	0.380	1.731	350E- 9			40E-11	670E- 9	J1
30 A02-8	12W	0.180	1.732	715E- 9			40E-11	670E- 9	J1
30 A02-8	24W	0.09	1.732	633E- 9			40E-11	670E- 9	J1
30 A02-8	42W	0.080	1.732	243E- 9			40E-11	670E- 9	J1
30 A02-8	80W	0.330	1.732	220E- 9			40E-11	670E- 9	J1
30 A02-8	115W	0.650	1.736	780E-10			40E-11	670E- 9	J1
30 A02-8	170W	0.990	1.736	415E-10			40E-11	670E- 9	J1
30 A02-8	250W	1.370	1.736	280E-10			40E-11	670E- 9	J1
30 A02-8	325W	1.600	1.736	215E-10			40E-11	670E- 9	J1
30 A02-8	40W	0.0087	2.875	50E-11	1.739	60E-11	40E-11	670E- 9	J1
30 A02-8	1W	0.0028	2.876	48E-11	1.741	55E-11	40E-11	670E- 9	J1
31 AO 5	7	0.0426	11.517	125E-11			35E-11	672E- 9	J1
31 AO 5	12	1.0505	11.517	630E- 9			35E-11	672E- 9	J1
31 AO 5	24	10.9673	11.517	682E- 8			35E-11	672E- 9	J1
31 AO 5	42	9.3223	11.518	528E- 8			35E-11	672E- 9	J1
31 AO 5	80	0.6179	11.519	338E- 9			35E-11	672E- 9	J1
31 AO 5	170	0.7370	11.519	170E- 9			35E-11	672E- 9	J1
31 AO 5	325	0.1484	11.520	818E-10			35E-11	672E- 9	J1
31 AO 5	500	0.9811	11.520	415E-10			35E-11	672E- 9	J1
31 AO 8	7	0.0318	12.465	208E-11			45E-11	670E- 9	J1
31 AO 8	12	1.4278	12.465	785E- 9			45E-11	670E- 9	J1
31 AO 8	24	11.6259	12.466	650E- 8			45E-11	670E- 9	J1
31 AO 8	42	9.1250	12.466	460E- 8			45E-11	670E- 9	J1
31 AO 8	80	0.6132	12.466	282E- 9			45E-11	670E- 9	J1
31 AO 8	170	0.7079	12.468	805E-10			45E-11	670E- 9	J1
31 AO 8	325	0.8565	12.468	472E-10			45E-11	670E- 9	J1
31 AO 8	500	0.5478	12.469	670E-10			40E-11	670E- 9	J1
31 A05-8	7W	0.0620	12.584	45E-11			45E-11	670E- 9	J1
31 A05-8	12W	2.2153	12.584	112E- 8			45E-11	670E- 9	J1
31 A05-8	24W	21.3518	12.586	130E- 7			45E-11	670E- 9	J1
31 A05-8	42W	18.7045	12.587	600E- 8			45E-11	670E- 9	J1
31 A05-8	80W	1.2252	12.588	605E- 9			45E-11	670E- 9	J1
31 A05-8	170W	1.3958	12.588	175E- 9			45E-11	670E- 9	J1
31 A05-8	325W	1.3441	12.589	108E- 9			45E-11	670E- 9	J1
31 A05-8	40W	0.0029	17.045	70E-11	16.042	77E-11	42E-11	655E- 9	J1
31 A05-8	30W	0.0024			16.044	75E-11	42E-11	655E- 9	J1
31 A05-8	20W	0.0016			16.045	72E-11	42E-11	655E- 9	J1
31 A05-8	10W	0.0010			16.045	65E-11	42E-11	655E- 9	J1
31 A05-8	5W	0.0006			16.046	63E-11	42E-11	655E- 9	J1
31 A05-8	3W	0.0004			16.047	58E-11	42E-11	655E- 9	J1
31 A05-8	1W	0.0004			16.048	55E-11	42E-11	655E- 9	J1

TABLE D.28 UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY)+

SAMPLE NUMBER	SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01 AO 2	7	1.8	0.541	340E- 8	40E-11	670E- 9	
01 AO 2	7	1.8	1.093	188E- 8	40E-11	668E- 9	J1
01 AO 2	7	1.8	1.938	875E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	2.499	568E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	4.052	230E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	4.250	210E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	4.951	163E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	5.471	150E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	5.961	130E- 9	40E-11	670E- 9	J1
01 AO 2	7	1.8	7.963	932E-10	40E-11	670E- 9	J1
01 AO 2	7	1.8	11.924	615E-10	40E-11	670E- 9	J1
01 AO 2	7	1.8	13.941	525E-10	50E-11	665E- 9	J1
01 AO 2	7	1.8	18.039	423E-10	40E-11	670E- 9	J1
01 AO 2	7	1.8	26.979	310E-10	40E-11	692E- 9	
01 AO 2	7	1.8	29.975	285E-10	40E-11	692E- 9	J1
01 AO 2	7	1.8	34.013	260E-10	40E-11	692E- 9	J1
01 AO 2	7	1.8	37.007	248E-10	40E-11	690E- 9	
01 AO 2	7	1.8	40.983	228E-10	40E-11	695E- 9	J1
01 AO 2	7	1.8	43.970	210E-10	40E-11	680E- 9	J1
01 AO 2	7	1.8	51.053	180E-10	30E-11	680E- 9	J1
01 AO 2	7	1.8	57.133	160E-10	40E-11	665E- 9	J1
01 AO 2	7	1.8	71.052	140E-10	40E-11	675E- 9	J1
01 AO 2	7	1.8	79.012	130E-10	40E-11	760E- 9	J1
01 AO 2	7	1.8	83.159	115E-10	30E-11	666E- 9	J1
01 AO 2	7	1.8	101.156	102E-10	40E-11	670E- 9	J1
01 AO 2	7	1.8	143.080	710E-11	35E-11	660E- 9	J1
01 AO 2	7	1.8	221.908	355E-11	40E-11	670E- 9	J1
01 AO 2	12	1.9	0.541	670E- 8	40E-11	670E- 9	J1
01 AO 2	12	1.9	1.093	370E- 8	40E-11	668E- 9	J1
01 AO 2	12	1.9	1.938	185E- 8	40E-11	670E- 9	J1
01 AO 2	12	1.9	2.499	125E- 8	40E-11	670E- 9	J1
01 AO 2	12	1.9	4.052	560E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	4.250	512E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	4.952	400E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	5.471	355E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	5.961	315E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	7.963	223E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	11.927	155E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	13.941	140E- 9	50E-11	665E- 9	J1
01 AO 2	12	1.9	18.039	112E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	19.956	100E- 9	40E-11	670E- 9	J1
01 AO 2	12	1.9	26.992	850E-10	40E-11	692E- 9	J1
01 AO 2	12	1.9	29.976	790E-10	40E-11	692E- 9	J1
01 AO 2	12	1.9	34.013	720E-10	40E-11	692E- 9	J1
01 AO 2	12	1.9	37.008	682E-10	40E-11	690E- 9	J1
01 AO 2	12	1.9	40.983	640E-10	40E-11	695E- 9	J1
01 AO 2	12	1.9	43.971	595E-10	40E-11	680E- 9	J1
01 AO 2	12	1.9	51.052	525E-10	30E-11	680E- 9	J1
01 AO 2	12	1.9	57.134	480E-10	40E-11	665E- 9	J1
01 AO 2	12	1.9	71.052	415E-10	40E-11	675E- 9	J1

TABLE B.28 UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY).

SAMPLE NUMBER	SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01 AO 2	12	1.9	79.013	390E-10	40E-11	760E- 9	J1
01 AO 2	12	1.9	83.160	354E-10	30E-11	666E- 9	J1
01 AO 2	12	1.9	101.156	310E-10	40E-11	670E- 9	J1
01 AO 2	12	1.9	143.080	210E-10	35E-11	660E- 9	J1
01 AO 2	12	1.9	221.908	110E-10	40E-11	670E- 9	J1
01 AO 2	24	2.8	0.541	535E- 8	40E-11	670E- 9	J1
01 AO 2	24	2.8	1.093	291E- 8	40E-11	668E- 9	J1
01 AO 2	24	2.8	1.938	145E- 8	40E-11	670E- 9	J1
01 AO 2	24	2.8	2.499	991E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	4.052	425E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	4.250	388E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	4.953	303E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	5.471	270E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	5.962	240E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	7.963	162E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	11.927	118E- 9	40E-11	670E- 9	J1
01 AO 2	24	2.8	13.941	105E- 9	50E-11	665E- 9	J1
01 AO 2	24	2.8	18.040	837E-10	40E-11	670E- 9	J1
01 AO 2	24	2.8	19.956	780E-10	40E-11	670E- 9	J1
01 AO 2	24	2.8	26.992	648E-10	40E-11	692E- 9	J1
01 AO 2	24	2.8	29.977	600E-10	40E-11	692E- 9	J1
01 AO 2	24	2.8	34.014	550E-10	40E-11	692E- 9	J1
01 AO 2	24	2.8	37.008	515E-10	40E-11	690E- 9	J1
01 AO 2	24	2.8	40.984	480E-10	40E-11	695E- 9	J1
01 AO 2	24	2.8	43.972	450E-10	40E-11	680E- 9	J1
01 AO 2	24	2.8	51.052	400E-10	30E-11	680E- 9	J1
01 AO 2	24	2.8	57.135	362E-10	40E-11	665E- 9	J1
01 AO 2	24	2.8	71.053	312E-10	40E-11	675E- 9	J1
01 AO 2	24	2.8	79.013	290E-10	40E-11	760E- 9	J1
01 AO 2	24	2.8	83.161	268E-10	30E-11	666E- 9	J1
01 AO 2	24	2.8	101.156	238E-10	40E-11	670E- 9	J1
01 AO 2	24	2.8	143.080	160E-10	35E-11	660E- 9	J1
01 AO 2	24	2.8	221.908	810E-11	40E-11	670E- 9	J1
01 AO 2	42	2.6	0.541	290E- 8	40E-11	670E- 9	J1
01 AO 2	42	2.6	1.093	160E- 8	40E-11	668E- 9	J1
01 AO 2	42	2.6	1.938	780E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	2.500	519E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	4.052	222E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	4.251	205E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	4.954	158E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	5.471	140E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	5.963	128E- 9	40E-11	670E- 9	J1
01 AO 2	42	2.6	7.964	910E-10	40E-11	670E- 9	J1
01 AO 2	42	2.6	11.927	615E-10	40E-11	670E- 9	J1
01 AO 2	42	2.6	13.941	538E-10	50E-11	665E- 9	J1
01 AO 2	42	2.6	18.041	438E-10	40E-11	670E- 9	J1
01 AO 2	42	2.6	19.958	410E-10	40E-11	670E- 9	J1
01 AO 2	42	2.6	26.993	340E-10	40E-11	692E- 9	J1
01 AO 2	42	2.6	29.978	312E-10	40E-11	692E- 9	J1
01 AO 2	42	2.6	34.015	290E-10	40E-11	692E- 9	J1

TABLE D.2M UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY)*

SAMPLE NUMBER			SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01	AO	2	42	2.6	37.009	275E-10	40E-11	690E- 9	J1
01	AO	2	42	2.6	40.984	260E-10	40E-11	695E- 9	J1
01	AO	2	42	2.6	43.972	240E-10	40E-11	680E- 9	J1
01	AO	2	42	2.6	51.050	210E-10	30E-11	680E- 9	J1
01	AO	2	42	2.6	57.135	295E-10	40E-11	665E- 9	J1
01	AO	2	42	2.6	71.054	168E-10	40E-11	675E- 9	J1
01	AO	2	42	2.6	79.015	160E-10	40E-11	760E- 9	J1
01	AO	2	42	2.6	83.162	145E-10	30E-11	666E- 9	J1
01	AO	2	42	2.6	101.156	130E-10	40E-11	670E- 9	J1
01	AO	2	42	2.6	143.080	850E-11	35E-11	660E- 9	J1
01	AO	2	42	2.6	221.912	435E-11	40E-11	670E- 9	J1
01	AO	2	80	3.4	0.541	135E- 8	40E-11	670E- 9	J1
01	AO	2	80	3.4	1.093	710E- 9	40E-11	668E- 9	J1
01	AO	2	80	3.4	1.938	345E- 9	40E-11	670E- 9	J1
01	AO	2	80	3.4	2.500	226E- 9	40E-11	670E- 9	J1
01	AO	2	80	3.4	4.052	960E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	4.251	880E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	4.955	685E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	5.472	602E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	5.963	533E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	7.964	380E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	11.928	260E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	13.942	225E-10	50E-11	665E- 9	J1
01	AO	2	80	3.4	18.042	189E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	19.958	172E-10	40E-11	670E- 9	J1
01	AO	2	80	3.4	27.034	150E-10	40E-11	692E- 9	J1
01	AO	2	80	3.4	29.978	138E-10	40E-11	692E- 9	J1
01	AO	2	80	3.4	34.015	130E-10	40E-11	692E- 9	J1
01	AO	2	80	3.4	37.010	122E-10	40E-11	690E- 9	J1
01	AO	2	80	3.4	40.985	112E-10	40E-11	695E- 9	J1
01	AO	2	80	3.4	43.973	110E-10	40E-11	680E- 9	J1
01	AO	2	80	3.4	51.045	960E-11	30E-11	680E- 9	J1
01	AO	2	80	3.4	57.137	860E-11	40E-11	665E- 9	J1
01	AO	2	80	3.4	71.055	738E-11	40E-11	675E- 9	J1
01	AO	2	80	3.4	79.016	690E-11	40E-11	760E- 9	J1
01	AO	2	80	3.4	83.164	645E-11	30E-11	666E- 9	J1
01	AO	2	80	3.4	101.156	575E-11	40E-11	670E- 9	J1
01	AO	2	80	3.4	143.080	390E-11	35E-11	660E- 9	J1
01	AO	2	80	3.4	221.912	240E-11	40E-11	670E- 9	J1
01	AO	2	170	4.9	0.541	795E- 9	40E-11	670E- 9	J1
01	AO	2	170	4.9	1.093	410E- 9	40E-11	668E- 9	J1
01	AO	2	170	4.9	1.938	193E- 9	40E-11	670E- 9	J1
01	AO	2	170	4.9	2.500	130E- 9	40E-11	670E- 9	J1
01	AO	2	170	4.9	4.053	540E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	4.251	498E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	4.955	385E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	5.472	345E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	5.964	305E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	7.964	218E-10	40E-11	670E- 9	J1

TABLE D.28 UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY)*

SAMPLE NUMBER			SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01	AO	2	170	4.9	11.929	150E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	13.942	133E-10	50E-11	665E- 9	J1
01	AO	2	170	4.9	18.042	108E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	19.958	100E-10	40E-11	670E- 9	J1
01	AO	2	170	4.9	27.035	830E-11	40E-11	692E- 9	J1
01	AO	2	170	4.9	29.980	790E-11	40E-11	692E- 9	J1
01	AO	2	170	4.9	34.015	730E-11	40E-11	692E- 9	J1
01	AO	2	170	4.9	37.013	680E-11	40E-11	690E- 9	J1
01	AO	2	170	4.9	40.988	635E-11	40E-11	695E- 9	J1
01	AO	2	170	4.9	43.975	610E-11	40E-11	680E- 9	J1
01	AO	2	170	4.9	51.044	530E-11	30E-11	680E- 9	J1
01	AO	2	170	4.9	57.138	492E-11	40E-11	665E- 9	J1
01	AO	2	170	4.9	71.056	400E-11	40E-11	675E- 9	J1
01	AO	2	170	4.9	79.018	395E-11	40E-11	760E- 9	J1
01	AO	2	170	4.9	83.165	370E-11	30E-11	666E- 9	J1
01	AO	2	170	4.9	101.156	350E-11	40E-11	670E- 9	J1
01	AO	2	170	4.9	143.080	230E-11	35E-11	660E- 9	J1
01	AO	2	170	4.9	221.914	205E-11	40E-11	670E- 9	J1
01	AO	2	250	2.1	0.541	290E- 9	40E-11	670E- 9	J1
01	AO	2	250	2.1	1.093	150E- 9	40E-11	668E- 9	J1
01	AO	2	250	2.1	1.938	710E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	2.501	469E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	4.054	200E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	4.252	190E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	4.955	145E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	5.472	135E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	5.964	120E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	7.965	85E-10	40E-11	670E- 9	J1
01	AO	2	250	2.1	11.930	615E-11	40E-11	670E- 9	J1
01	AO	2	250	2.1	13.943	550E-11	50E-11	665E- 9	J1
01	AO	2	250	2.1	18.043	442E-11	40E-11	670E- 9	J1
01	AO	2	250	2.1	19.961	400E-11	40E-11	670E- 9	J1
01	AO	2	250	2.1	27.038	320E-11	40E-11	692E- 9	J1
01	AO	2	250	2.1	29.980	290E-11	40E-11	692E- 9	J1
01	AO	2	250	2.1	34.021	295E-11	40E-11	692E- 9	J1
01	AO	2	250	2.1	37.015	275E-11	40E-11	690E- 9	J1
01	AO	2	250	2.1	40.991	260E-11	40E-11	695E- 9	J1
01	AO	2	250	2.1	43.977	265E-11	40E-11	680E- 9	J1
01	AO	2	250	2.1	51.041	213E-11	30E-11	680E- 9	J1
01	AO	2	250	2.1	57.139	220E-11	40E-11	665E- 9	J1
01	AO	2	250	2.1	71.057	195E-11	40E-11	675E- 9	J1
01	AO	2	250	2.1	79.019	180E-11	40E-11	760E- 9	J1
01	AO	2	250	2.1	83.167	155E-11	30E-11	666E- 9	J1
01	AO		250	2.1	101.156	150E-11	40E-11	670E- 9	J1
01	AO	2	250	2.1	143.080	100E-11	35E-11	660E- 9	J1
01	AO	2	250	2.1	221.915	105E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	0.541	238E- 9	40E-11	670E- 9	J1
01	AO	2	325	1.6	1.093	122E- 9	40E-11	668E- 9	J1
01	AO	2	325	1.6	1.941	580E-10	40E-11	670E- 9	J1

TABLE D.28 UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY)+

SAMPLE NUMBER			SIEVE (MESH)	WEIGHT (GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
01	AO	2	325	1.6	2.501	388E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	4.054	170E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	4.252	160E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	4.956	124E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	5.475	115E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	5.964	102E-10	40E-11	670E- 9	J1
01	AO	2	325	1.6	7.967	762E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	11.930	535E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	13.944	470E-11	50E-11	665E- 9	J1
01	AO	2	325	1.6	18.045	365E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	19.961	345E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	27.038	290E-11	40E-11	692E- 9	J1
01	AO	2	325	1.6	29.981	268E-11	40E-11	692E- 9	J1
01	AO	2	325	1.6	34.022	250E-11	40E-11	692E- 9	J1
01	AO	2	325	1.6	37.017	235E-11	40E-11	690E- 9	J1
01	AO	2	325	1.6	40.993	220E-11	40E-11	695E- 9	J1
01	AO	2	325	1.6	43.979	225E-11	40E-11	680E- 9	J1
01	AO	2	325	1.6	51.041	180E-11	30E-11	680E- 9	J1
01	AO	2	325	1.6	57.139	170E-11	40E-11	665E- 9	J1
01	AO	2	325	1.6	71.059	150E-11	40E-11	675E- 9	J1
01	AO	2	325	1.6	79.019	140E-11	40E-11	760E- 9	J1
01	AO	2	325	1.6	83.168	130E-11	30E-11	666E- 9	J1
01	AO	2	325	1.6	101.156	135E-11	40E-11	670E- 9	J1
01	AO	2	325	1.6	143.080	90E-11	35E-11	660E- 9	J1
01	AO	2	325	1.6	22..916	85E-11	40E-11	670E- 9	J1
01	AO	2	500	1.7	0.541	385E- 9	40E-11	670E- 9	J1
01	AO	2	500	1.7	1.093	200E- 9	40E-11	668E- 9	J1
01	AO	2	500	1.7	1.941	952E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	2.502	631E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	4.055	280E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	4.252	260E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	4.956	208E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	5.475	190E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	5.965	170E-10	40E-11	670E- 9	J1
01	AO	2	500	.7	7.967	120E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	11.931	80E-10	40E-11	670E- 9	J1
01	AO	2	500	1.7	13.945	720E-11	50E-11	665E- 9	J1
01	AO	2	500	1.7	18.047	580E-11	40E-11	670E- 9	J1
01	AO	2	500	1.7	19.9.1	510E-11	40E-11	670E- 9	J1
01	AO	2	500	1.7	27.041	420E-11	40E-11	692E- 9	J1
01	AO	2	500	1.7	29.982	385E-11	40E-11	692E- 9	J1
01	AO	2	500	1.7	34.025	370E-11	40E-11	692E- 9	J1
01	AO	2	500	1.7	37.019	335E-11	40E-11	690E- 9	J1
01	AO	2	500	1.7	40.993	320E-11	40E-11	695E- 9	J1
01	AO	2	500	1.7	51.039	263E-11	30E-11	680E- 9	J1
01	AO	2	500	1.7	57.142	230E-11	40F-11	665E- 9	J1
01	AO	2	500	1.7	71.060	190E-11	40E-11	675E- 9	J1
01	AO	2	500	1.7	79.021	190E-11	40E-11	760E- 9	J1
01	AO	2	500	1.7	33.170	180E-11	30E-11	666E- 9	J1
01	AO	2	500	1.7	101.156	170E-11	40E-11	670E- 9	J1
01	AO	2	500	1.7	143.080	110E-11	35E-11	660E- 9	J1
01	AO	2	500	1.7	221.916	80E-11	40E-11	670E- 9	J1

TABLE D.28 UNCORRECTED 4-PI IONIZATION CHAMBER RADIATION MEASUREMENTS (DECAY)+

SAMPLE NUMBER	SILVE WEIGHT (MESH)(GRAMS)	AGE (DAYS)	ACTIVITY (MA)	BKG (MA)	STD (MA)	
31 AO 4A	23.5185	221.920	515E- 9	40E-11	670E- 9	J1
31 AO 4A	23.5185	143.080	105E- 8	35E-11	660E- 9	J1
31 AO 4A	23.5185	101.156	158E- 8	40E-11	670E- 9	J1
31 AO 4A	23.5185	83.151	180E- 8	30E-11	666E- 9	J1
31 AO 4A	23.5185	79.003	200E- 8	40E-11	760E- 9	J1
31 AO 4A	23.5185	71.049	220E- 8	40E-11	675E- 9	J1
31 AO 4A	23.5185	57.126	265E- 8	40E-11	665E- 9	J1
31 AO 4A	23.5185	51.075	300E- 8	30E-11	680E- 9	J1
31 AO 4A	23.5185	43.981	350E- 8	40E-11	680E- 9	J1
31 AO 4A	23.5185	40.996	385E- 8	40E-11	695E- 9	J1
31 AO 4A	23.5185	37.021	425E- 8	40E-11	690E- 9	J1
31 AO 4A	23.5185	34.027	460E- 8	40E-11	692E- 9	J1
31 AO 4A	23.5185	29.971	510E- 8	40E-11	692E- 9	J1
31 AO 4A	23.5185	26.986	570E- 8	40E-11	692E- 9	J1
31 AO 4A	23.5185	19.951	715E- 8	40E-11	670E- 9	J1
31 AO 4A	23.5185	18.038	778E- 8	40E-11	670E- 9	J1
31 AO 4A	23.5185	13.962	970E- 8	50E-11	665E- 9	J1
31 AO 4A	23.5185	11.929	116E- 7	40E-11	670E- 9	J1
31 AO 4A	23.5185	10.269	142E- 7	40E-11	670E- 9	J1
31 AO 4B	1.0008	10.269	569E- 9	40E-11	670E- 9	J1
31 AO 4B	1.0008	11.938	490E- 9	40E-11	670E- 9	J1
31 AO 4B	1.0008	13.963	420E- 9	50E-11	665E- 9	J1
31 AO 4B	1.0008	18.034	327E- 9	40E-11	670E- 9	J1
31 AO 4B	1.0008	19.948	290E- 9	40E-11	670E- 9	J1
31 AO 4B	1.0008	26.981	228E- 9	40E-11	692E- 9	J1
31 AO 4B	1.0008	29.972	205E- 9	40E-11	692E- 9	J1
31 AO 4B	1.0008	34.028	190E- 9	40E-11	692E- 9	J1
31 10 4B	1.0008	37.021	172E- 9	40E-11	690E- 9	J1
31 AO 4B	1.0008	40.997	160E- 9	40E-11	695E- 9	J1
31 AO 4B	1.0008	51.076	117E- 9	30E-11	680E- 9	J1
31 AO 4B	1.0008	57.126	108E- 9	40E-11	665E- 9	J1
31 AO 4B	1.0008	71.049	855E-10	40E-11	675E- 9	J1
31 AO 4B	1.0008	79.005	775E-10	40E-11	760E- 9	J1
31 AO 4B	1.0008	83.152	700E-10	30E-11	666E- 9	J1
31 AO 4B	1.0008	101.156	610E-10	40E-11	670E- 9	J1
31 AO 4B	1.0008	143.080	390E-10	35E-11	660E- 9	J1
31 AO 4B	1.0008	221.920	198E-10	40E-11	670E- 9	J1

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